



MEMORANDUM

To: Black Diamond Hearing Examiner

From: Colin Lund, Chief Entitlement Officer, YarrowBay 

cc: Nancy Rogers, Legal Counsel for YarrowBay
Megan Nelson, Director of Legal Affairs, YarrowBay

Re: YarrowBay's Response to Written Public Comments regarding The Villages Preliminary Plat Phase 2 Plat C (PLN13-0027)

Date: December 11, 2014

I. INTRODUCTION

BD Village Partners, LP ("YarrowBay") submits this response to the written public comments (Exhibits 6 through 11, inclusive, and Exhibits 50 through 52, inclusive) submitted to the City of Black Diamond ("City") regarding The Villages Preliminary Plat Phase 2 Plat C (PLN13-0027) ("Plat 2C").

YarrowBay seeks to respond to all the issues raised in such written comments whether or not outside the proper scope of this plat hearing. YarrowBay's response to such written comments, however, does not supersede any of our relevancy objections and shall not be viewed by any party as a waiver.

Throughout this written response, references to numerical exhibits, e.g., Exhibit 1, are references to exhibits referenced and listed in the Community Development Department Staff Report dated November 25, 2014 ("Staff Report") commencing on page 5. Comments are shown in italics and YarrowBay's responses to such comments are shown in plain text.

II. YARROWBAY'S RESPONSE TO PLAT2C WRITTEN PUBLIC COMMENTS

Exhibit 6: Public Comment: Karen Walter, Muckleshoot Tribe Fisheries Division (email messages, June 17 and July 1, 2014)

- 1. [We need additional information to fully evaluate this project as noted below:] Details regarding the proposed stormwater management plan, including the location of the stormwater facilities and the proposed treatment levels.*

Please see Exhibit 20.

- 2. We also need a copy of the wetland delineation reports and the proposed wetland buffer averaging and mitigation plans. As part of this information, we would like to know why the wetland buffer averaging is being proposed (as opposed to avoid wetlands and their buffers with this project), and how trails located in what appears to be regulated wetland buffers is being mitigated as vegetation will not be able to grow on these trails. Please note that there is insufficient information in the checklist to make these determinations.*

Please see Exhibits 28 and 30. As summarized in these exhibits, YarrowBay's plan to buffer average in Plat 2C results in a net gain of 24,105 square feet of wetland buffer area. Moreover, the plan increases the protection afforded to wetlands because the small areas of buffer that are intended to be used for development (a maximum of eight feet in densely vegetated buffers) are in areas where the buffer that will remain already provides excellent protection for the associated wetland. The areas proposed to be added to the wetland buffer, by contrast, include more sensitive areas, meaning that the associated wetland will benefit from the added protection of this increased buffer area.

The Plat 2C trails planned for wetland buffers are all located and sized in compliance with BDMC §19.10.220(B)(3). All trails are located within the outer 25% of the wetland buffer, even in buffers (Category II, III, and IV) that do not require placement that is this stringent. Moreover, per the Staff Report's recommended Conditions of Approval (38, 39, and 43), YarrowBay shall submit a site plan for portions of trails that cross wetland buffers to the City for its review prior to construction; the trails shall be field located to avoid removing significant trees, woody debris will be placed in naturalistic locations; culverts will be provided when the trail bisects surface of groundwater drainages; the trail alignments will be combined with infiltration trenches where feasible; and all trails shall be confined to the outer edges of buffers.

Exhibit 7: Public Comment: Cynthia Wheeler (letter July 1, 2014)

- 1. Please note and have added to the SEPA MDNS mitigation measures that any disturbance of soil near Rock Creek may require WA Dept. of Fish and Wildlife review and a Hydraulic Permit Approval.*

In response to Ms. Wheeler's above comment, YarrowBay proposes to include the following new plat condition of approval in the Hearing Examiner's decision:

Should soil disturbing activities associated with Plat 2C in the Rock Creek basin require review by the Washington State Department of Fish and Wildlife and/or a Hydraulic Permit Approval, the Master Developer shall secure such review and/or permit, as necessary.

- 2. Please note and have added to the SEPA MDNS mitigation measure that any soil disturbing activities will result in the release of phosphorous in the Lake Soil Basin and may require mitigation measures to address and correct the impact associated with such activities.*

YarrowBay requested that its consultant, TetraTech, review Ms. Wheeler's above comment. TetraTech's response is attached to this memorandum as Attachment 1. In summary, the best

management practices (BMPs) included within temporary erosion and sediment control plan required by MPD Condition of Approval No. 71¹ for any site construction associated with Plat 2C will prevent transport of soils and are specifically intended to retain phosphorus on site.

- 3. There should be some concern about the archaeological shovel probe activity near Rock Creek with regard to the listing of the Puget Sound Steelhead (*O. mykiss*) as a threatened species by the National Marine Fisheries Service and the January, 2013 map of Proposed Critical Habitat for Puget Sound Steelhead identifying the entire Rock Creek System, within the City of Black Diamond, as this species critical habitat. The release of phosphorous and/or silting into Rock Creek would certainly compromise this "species critical habitat" and should also require review by the WA State Dept. of Fish and Wildlife. (National Marine Fisheries Service in the September, 2008 version of the Federal Register and January, 2013 map of Proposed Critical Habitat for Puget Sound Steelhead published in the Federal Register.) (This data is also noted by the City of Black Diamond's Natural Resource Director in the attached city correspondence.)*

Based on conversations with Historical Research Associates, Inc., YarrowBay's archeologist consultant, the site investigation work associated with City Staff's recommended Condition of Approval 81 [MDNS Mitigation Measure] will be limited to proposed developed area and potential areas surrounding the proposed pedestrian trail. A total of between 5 to 10, 1.5-foot diameter by 3-foot deep holes per acre, will be dug by hand throughout the developed portion of the site. No test pits will be located within the wetland buffer, east of the proposed pedestrian trail. Therefore the holes will have an almost 225-foot dense natively vegetated buffer between them and the Rock Creek wetland system. Per Attachment 2, it is the professional opinion of YarrowBay's wetland consultant, Wetland Resources Inc., that this minor site investigation work will not impact Wetland TOS, Rock Creek, or any associated fish habitat.

Exhibit 8: Public Comment: Erika Morgan (email and attachment, July 1, 2014)

YarrowBay requested that its wildlife consultant, Wetlands & Wildlife, review Ms. Morgan's plat comments and prepare a response. Please see Attachment 3 attached hereto. In summary, in Mr. Spooner's professional opinion, Plat 2C will not adversely impact any habitats of primary association for any wildlife species mentioned in Ms. Morgan's email and attachment or any other species listed on the federal or state endangered, threatened, or sensitive lists.

Exhibit 9: Public Comment: Cindy Proctor (email message with attachments, July 1, 2014)

There has been a material change in the underlying conditions of facts that bring the entire project into non-compliance with the conditions of approval (COAs) and the [Comprehensive School] mitigation agreement.

The Villages MPD Condition of Approval No. 98 states that the Comprehensive School Mitigation Agreement ("CSMA") provides for "adequate mitigation of impacts to school

¹ Note: All MPD Conditions of Approval included within The Villages MPD Permit Approval (Black Diamond Ord. 10-946) and incorporated as Exhibit "C" to The Villages MPD Development Agreement (Black Diamond Ord. 11-970) are independently applicable to each The Villages MPD implementing project, such as Plat 2C, and do not need to be restated as a project-specific condition of approval in order to control.

facilities” and the CSMA itself provides that it serves as complete mitigation for all school impacts. Villages MPD Condition of Approval No. 98 precludes any further mitigation through Plat 2C as discussed in Section II(B)(1) of the Hearing Examiner’s Preliminary Plat 1A decision dated December 10, 2012 (the “PP1A Decision”). Further, as noted in the PP1A Decision, many of Ms. Proctor’s requests amount to an attempt to renegotiate the terms of the CSMA, which was satisfactory to the Enumclaw School District. The District itself would be expected to have a better understanding than Ms. Proctor of what CSMA terms it needs to mitigate school impacts.

The Villages MPD as a whole provides adequate provision for school sites through the terms of the CSMA. The approved Villages Preliminary Plat 1A provides, pursuant to the CSMA, a 12.5 acre elementary school site (lots 1L and 2L) to the west of Plat 2C. The Villages Preliminary Plat 1A elementary school site is of sufficient size to accommodate necessary school buildings, parking and typical sports fields and playgrounds associated with an elementary school use that can serve Plat 2C in addition to PP1A. *See also* page 115 of Staff Report regarding the appropriateness of Plat 2C for an additional school site.

In addition, per Section 13.3 of The Villages MPD Development Agreement, school mitigation is also accomplished through the CSMA via the payment of school mitigation fees. The mitigation fee is based on the Enumclaw School District’s calculations concerning the expected student generation rate of The Villages MPD and the anticipated cost of new school facilities. Section 3.1 of the CSMA provides that the Agreement “constitutes full, total, complete and sufficient mitigation of the impact of full build out of The Villages MPD on school facilities of the District.”

The Enumclaw School District has been notified of Plat 2C. As of the date of this memorandum, no comments have been received by the City regarding Plat 2C from the district.

Exhibit 10: Public Comment: Gil Bortleson (letter with attachment, July 2, 2014)

Comments on MDNS and Adoption of Existing Environmental Document:

- 1. The Environmental Checklist makes specific statements about conditions that will be met but these conditions are not listed on the Plat or its approval document.***

Mr. Bortleson unfortunately does not list the “specific statements about conditions that will be met” in the Environmental Checklist to which he refers. Absent more information, it is difficult to respond more specifically. YarrowBay has reviewed its Plat 2C SEPA checklist and has determined that statements contained within the checklist are indeed recommended conditions of approval contained within the Staff Report.

- 2. There is insufficient documentation in the record that describes the details of the “independent” review.***

Prior to the City’s issuance of the MDNS, the City and its consultants conducted multiple rounds of review for the documents YarrowBay submitted in support of Plat 2C. All of these documents cited as exhibits for Plat 2C within the Staff Report. For the reader’s ease of review, a table containing the submission dates and the identity of the outside consultant performing the respective review for each of the required documents is provided below:

Plat 2C Document	Initial Submission Date	Comments Date	Revision Date	Second Comments Received	Second Revision Submitted
Plat 2C Geotechnical Report (Exhibit 23)	12/5/2013	3/24/2014 (Comments by SubTerra) (Exhibit 23a)	4/21/2014 (Exhibit 23a)	N/A	N/A
Plat 2C Drainage Analysis (Exhibit 20)	11/8/2013	5/12/2014 (Review by RH2)(Exhibit 20a) 7/17/2014 (Review by RH2) (Exhibit 20b) 8/12/2014 (Stormwater Deviation Approval) (Exhibit 20c)	N/A	N/A	N/A
Plat 2C SAS, BAP, WHA (Exhibits 28a, 28b)	12/24/2013, 2/24/2014	3/31/2014 (Comments by Perteet) (Exhibit 28c)	5/6/2014 (Exhibit 28) 4/28/2014 (Exhibit 28d) 5/8/2014 (Exhibit 28f)	5/19/2014 (Comments by Perteet) (Exhibit 28e)	6/12/2014 (Exhibit 28g)
Plat 2C Transportation (Exhibit 24)	12/19/2013	2/27/2014 (Comments by Parametrix) (Exhibit 24a)	3/31/2014 (Exhibit 24b)	5/2/2014 (Parametrix Final Review) (Exhibit 24c)	N/A
Construction Traffic Impacts Analysis (Exhibit 31)	4/22/2014	5/19/2014 (Comments by Parametrix) (Exhibit 31a)	5/22/2014 (Exhibit 31b)	N/A	N/A
Short-Term Construction Noise Mitigation Plan (Exhibit 26)	12/20/2013	2/28/2014 (Comments by City Staff) (Exhibit 40)	3/13/2014 (Exhibit 26)	N/A/	N/A

3. *The City relied on the previous programmatic non-project environmental review and did not conduct a project level environmental review.*

The City conducted project level environmental review for Plat 2C that resulted in the MDNS issued by the City on June 17, 2014. In addition to reviewing and adopting the FEIS for The Villages MPD, the MDNS states that the City's SEPA Responsible Official reviewed "the completed environmental checklist, The Villages MPD Phase 2 Plat C Preliminary Plat application and related materials" and determined from that comprehensive review that Plat 2C would not have a probable significant adverse impact on the environment if the mitigation measures included in the MDNS were implemented. Therefore, while the City did utilize the adopted FEIS (in conformance with City code and Washington State law), the City also reviewed project-specific Plat 2C documents in making its MDNS determination.

4. *The City did not analyze the impacts of vaguely defined "additional tracts" and did not provide specific land uses and development activities in these areas.*

The specific land uses and development activities in Plat 2C's "additional tracts" are shown in the tables located on Sheet CV4 of the Plat 2C plan set (Exhibit 2). There is nothing in the record to support the Mr. Bortleson's allegation that "the City did not analyze the impacts" of such tracts, and, to the contrary, the Staff Report specifically includes recommended condition of approval 47: "To ensure compliance with BDMC Chapter 19.10, subsequent review of development activities in future development tracts adjacent to Wetlands E7, E8 and E10 is required. [Note: MDNS Mitigation Measure]".

5. *The mitigation conditions proposed only deal with a very narrow range of issues. Even though various technical submittals recommend many conditions, and even though the applicant has stated his intent to comply with some of these conditions, none of them have been incorporated into the conditions of approval prepared by the City for the plat.*

It is unclear which conditions this comment is referencing. The Staff Report contains 81 recommended conditions of approval including the ten MDNS conditions that the City previously determined are required to mitigate potential environmental impacts from Plat 2C. If there are in fact conditions that YarrowBay has agreed to during the Plat 2C review process that do not appear in this extensive list, YarrowBay is agreeable to the Hearing Examiner including such conditions in his decision.

6. *The condition regarding archaeological resources requires a report but does not require protection.*

In response to Mr. Bortleson's comment above, YarrowBay is recommending the following additional language be added to the Staff Report's recommendation condition of approval 81:

Prior to submittal of the first clearing/grading permit for any portion of Plat [2]C, the proponent shall place additional archaeological shovel probes on lands near Rock Creek (Parcel E) and provide a report to the City prepared by a qualified professional summarizing the results and any recommended actions. Such

recommended actions shall be conditions of any clearing and grading permit issued by the City for Plat 2C.

7. *The condition regarding an update to the preliminary drainage analysis only addresses “subtle” design changes and does not provide for any meaningful review of SEPA impacts relating to stormwater management.*

This MDNS Mitigation Measure has been incorporated into the Staff Report as recommended condition of approval 13. The condition requires an update to the Plat 2C preliminary drainage analysis (Exhibit 3g) if any design changes are made between the preliminary plat stage and final engineering. The condition presumably includes the word “subtle” because only subtle changes, at most, are anticipated to be made between the preliminary plat stage and final engineering. Should an update to the Plat 2C preliminary drainage analysis reveal new information about impacts to the environment that have not been analyzed, state law requires that the City review this information to determine what additional mitigation, if any, is required.

To eliminate any confusion, however, YarrowBay proposes rewriting recommended condition of approval 13 to remove the word subtle, as follows:

The Preliminary Drainage Analysis (Exhibit 20) must be updated during final engineering review of Plat 2C to account for any ~~subtle~~ design changes from the preliminary plat design to the final engineering construction drawings. The update to the preliminary drainage analysis should use the same methodology as the applicant’s consultant previously completed. [Note: MDNS Mitigation Measure]

8. *The condition requiring infiltration trenches to be combined with trail alignments is inconsistent with provisions of 19.10.120 since the conditions for trail alignments are more lenient than the conditions for infiltration trenches. This should be clarified to make sure that the more stringent condition applies.*

This comment refers to the MDNS Mitigation Measure that has been incorporated into the Staff Report as recommended condition of approval 39b: “Trail alignments within wetland buffers shall be combined with the infiltration trenches, wherever feasible, subject to final design work to be reviewed by the City.” It is unclear to YarrowBay how this condition is inconsistent with Black Diamond Municipal Code §19.10.120. YarrowBay agrees that this condition does not shield the design of the infiltration trenches from the requirements contained within City code. YarrowBay further agrees that the infiltration trenches shall be located to conform with the requirements contained in Black Diamond Municipal Code §19.10.220(C)(5). Rather than allowing YarrowBay to change the location of the infiltration trenches, this condition serves to require YarrowBay to field locate the soft surface trails, where feasible, with the infiltration trenches (whose location, again, must conform to City code) in order to reduce any impacts to Plat 2C’s wetland buffers.

9. *The condition that requires a construction management plan in the future is inadequate because the plan should be determined at the preliminary plat stage. In fact, the preliminary plat approval documents include discussion and specific*

determinations about the construction management plan but do so in a piecemeal manner.

This comment refers to the MDNS Mitigation Measure that has been incorporated into the Staff Report as recommended condition of approval 40: “Pursuant to the City of Black Diamond Engineering Design & Construction Standards, Section 1.17, a construction management plan shall be developed by the applicant for review and approval by the City before the clearing and grading permit is issued. . . .” The timing of submittal of such plan is set forth in the City’s Engineering Design & Construction Standards at Section 1.17. Earlier submittal would require an amendment to such City adopted standards. Moreover, providing a construction management plan at the final engineering and design stage is a more logical place for the City to require it because the information contained at the preliminary plat stage is too general to provide the basis for a realistic construction management plan. For example, the details of how roads will be constructed are creating during the final engineering and design stage. Those details are used in creating a construction management plan. Were the City to require a construction management plan at the preliminary plat stage, the City would be required to devote time and resources to review a document that would likely change significantly—requiring even more time and resources for review—before construction actually begins. Requiring a construction management plan later in the process, when both the City and the applicant have a better idea of what will be required, helps the City save money and avoid unnecessary work.

Comments on Tree Inventory Report:

- 1. The report is based on a sampling study with a large margin of error. At this stage in plat review, the applicant should have been required to do an actual survey instead of a sample study.***

There is no requirement in the Black Diamond Municipal Code that a tree survey be performed and submitted with a preliminary plat application or for preliminary plat approval. Instead, BDMC Ch. 19.30 requires such survey prior to issuance of a tree removal permit for Plat 2C. This timing is consistent with the Staff Report’s recommended condition of approval 71, which provides: “The applicant will submit a report with the exact number of significant trees to be removed, and identify mitigation per BDMC 19.30.070 (e.g., planting of replacement trees or payment to the City tree mitigation fund). . . .”

- 2. The study area only covered 41.14 acres of the total 136 acre plat. Even though the unstudied areas are not proposed for development, the applicant was still required to conduct a tree inventory for the entire site. Moreover, potential utility and trail corridors were not studied.***

There is no requirement in the Black Diamond Municipal Code that a tree survey be performed for areas not proposed for site disturbance or development. As discussed above, the purpose of a tree survey pursuant to BDMC Ch. 19.30 is to determine the number of trees planned for removal for which the applicant must provide a bond prior to clearing and grading. Mr. Bortleson’s above comment acknowledges that the area inventoried is the only area proposed for development and, therefore, is the only area where trees will be cut.

Comments on Status Update on Stormwater and Groundwater Monitoring, dated May 6, 2014:

- 1. The Applicant has failed to comply with conditions of approval requiring monitoring and the establishment of a baseline phosphorous load. The consultant's report identifies on-going work and is a work in progress. The report should be concluded and reviewed by the City before the project SEPA review and plat conditions are approved.*

Contrary to Mr. Bortleson's above comment, YarrowBay has complied with all stormwater and groundwater monitoring conditions of approval set forth in The Villages MPD Permit. Such conditions are set forth in Exhibit "O" of The Villages MPD Development Agreement and state as follows:

Prior to construction of the first implementing project within the Lake Sawyer drainage basin, the Master Developer, in conjunction with the City of Black Diamond shall review, plan and institute the following:

- 1. Monitor pre-development phosphorous levels at pre-determined locations within the project drainage basins. Monitoring is to occur consistently over the course of at least one water year (October to September) in accordance with the procedures and criteria outlined in Chapters 6 through 12 of the OAPP (see Attachment 1). Use data collected over the water year to establish a baseline phosphorous load from the project. This load should be factored to an average year rainfall volume for future comparisons of phosphorous loads for years where the rainfall is more or less than the average.*

(emphasis added).

The only timing associated with the above stormwater monitoring condition is that monitoring be performed and the associated data be used to establish a baseline phosphorous load from the MPDs prior to construction of the first implementing project within the Lake Sawyer drainage basin. Such construction has not yet commenced and, therefore, there is no requirement that such report be completed at this time. However, YarrowBay's consultant has performed the monitoring of the pre-development phosphorous levels (see Exhibits 13a-c).

Comments on Preconstruction Stormwater Monitoring in Rock Creek dated November 2013 and updated January 2014:

- 1. The report states that the Ginder Creek site has been chosen by the City as a compensating site in accordance with MPD condition of approval number 84. However, there is no information in the record that substantiates this decision, and it was not subject to any SEPA review. No alternatives to this site were considered.*

The Preconstruction Stormwater Monitoring in Rock Creek dated November 2013 and updated January 2014 (Exhibit 13) states, contrary to the allegations of Mr. Bortleson, that YarrowBay selected the Ginder Creek project as a compensating site in consultation with the City. This selection process conforms with The Villages MPD Condition of Approval No. 84, which states that the "Applicant agrees to work cooperatively with the City to identify opportunities where the City can reduce phosphorous sources or improve phosphorous treatment on existing City lands

and for existing City owned or maintained stormwater facilities” and Exhibit O, which states, in pertinent part, that the “Master Developer, in conjunction with the City of Black Diamond shall review, plan and institute the following: 2. Select one or two possible compensation projects...” YarrowBay selected the Ginder Creek site from the list contained in the City’s approved, publicly available Capital Improvement Plan, and this selection was reviewed by The Water Quality Review Committee, which contains representatives from City staff and the community.

Furthermore, no SEPA review is required for the applicant’s selection of the Ginder Creek site as a phosphorous compensating site because detailed project plans have not yet been developed for the project nor has project permitting been initiated. Therefore, no requirement for a SEPA threshold determination has been triggered.

Comments on Wetland Buffer Vegetation Management Plan prepared by Wetland Resources [(“WRI”)] on December 19, 2013:

2. *The report recommends specific conditions that are not included in the conditions of approval, even though the Applicant has asserted their intent to abide by those conditions.*

Compliance with the Wetland Buffer Vegetation Management Plan for Plat 2C prepared by Wetland Resources Inc. (Exhibit 27) is required by the Staff Report’s recommended condition of approval 42. This condition addresses the concern raised in Mr. Bortleson’s above comment.

3. *The Perteet recommendations are not incorporated into the conditions of approval, and should be.*

Contrary to Mr. Bortleson’s above comment, the Perteet recommendations are incorporated into the Staff Report’s recommended condition of approval 42. Perteet’s memorandum (Exhibit 28c) states as follows: “It is assumed from our field observations that the wetland buffers that remain after clearing will have substantially similar species composition and spacing as the sampled area. However, post-clearing monitoring of the buffer areas is required [to] verify that the tree density remains comparable to this tree inventory.” And, the Staff Report’s recommended condition of approval 42 provides in pertinent part: “The applicant shall comply with the Wetland Buffer Vegetation Management Plan for The Villages Phase 2 Plat C including: when clearing adjacent to a wetland buffer, the developer shall *conduct monitoring which includes: (i) initial compliance/as-built report of post-development tree density in the wetland and adjacent buffer; (ii) Annual site inspections in the autumn to document that the minimum tree density (20) and weedy/invasive plant coverages are maintained in the wetland and its buffer; . . .*” (emphasis added).

4. *The additional conditions proposed by Wetland Resources in response to the Perteet comments should be included as specific conditions of approval.*

Compliance with the additional conditions proposed by Wetland Resources in response to the Perteet comments is required by the Staff Report’s recommended condition of approval 42.

5. *The report notes that the City’s significant tree ordinance exempts trees that are “non-significant” while pointing out that those trees have equivalent ecological significance.*

This constitutes a negative environmental impact that cannot be mitigated by simple application of the City's code.

Mr. Bortleson's above comment takes the statements made by Wetland Resources Inc. in the Wetland Buffer Vegetation Management Plan (Exhibit 27) out of context. The Wetland Buffer Vegetation Management Plan provides: "From an ecological perspective, the functions and values provided by 'non-significant trees' are consistent with functions and values provided by 'significant trees'" and, therefore, "non-significant trees" should be considered in determining the total tree density calculation within wetland buffers pre- and post-development. The Wetland Buffer Vegetation Management Plan does not state that cutting non-significant trees within Plat 2C development areas (i.e., not within sensitive areas) constitutes a significant environmental impact or that the required tree mitigation within BDMC Ch. 19.30 is insufficient. Moreover, RCW 43.21C.240 and WAC 197-11-660 preclude mitigation in excess of what is authorized by BDMC Ch. 19.30.

6. The report makes no provision for effective barriers to ensure that clearing and grading does not intrude into wetland buffers.

MPD Condition of Approval No. 117 states that "Structural measures such as silt fences and temporary sediment ponds shall be used to avoid discharging sediment into wetlands and other critical areas." In addition, the Staff Report's recommended condition of approval 72 provides:

Prior to any clearing or grading activities within Preliminary Plat 2C, clearing limits shall be marked in the field with continuous ribbon, silt fence or orange construction fence where appropriate to clearly indicate clearing limits. Trees within or near clearing limits to be saved shall be clearly marked. Orange construction fence shall be installed as a tree protection fence outside of drip lines of trees to be saved prior to the start of clearing and grading operations.

These conditions are directly responsive to Mr. Bortleson's above comment and ensure there will be effective barriers in place so that Plat 2C clearing and grading activities do not intrude into wetland buffers.

Comments on the Response to Perteet Wetlands Comments submitted by Wetland Resources:

8. The response by Wetland Resources excuses an acknowledged omission by stating that the Development Agreement's delineations are "final and complete". This is in violation of the City's code and other legal requirements. State law requires the City to apply applicable law, and also requires Development Agreements to comply with applicable law. Moreover, the Development Agreement itself includes language that contradicts its own "final and complete" language and suggests that more accurate delineations at the preliminary plat stage are appropriate. The omission identified by Perteet should be corrected.

The omission identified by Perteet, and referenced in Mr. Bortleson's above comment, was the absence of wetland determination data forms of paired wetland/upland plots for Wetlands E7, E8, E10, and 213. In response to Perteet's comments, WRI provided the requested data forms and these forms have been made a part of the Plat 2C record Exhibit 28g). Mr. Bortleson also alleges that the Development Agreement's "final and complete" provision regarding wetland

delineations is a violation of the City Code and other legal requirements. Not only does Mr. Bortleson fail to identify the legal requirements supposedly violated, but his comment constitutes a prohibited collateral attack. The provisions of The Villages MPD Development Agreement cannot be revisited in the context of the Plat 2C application review and hearing.

- 9. The drainage divide that was the basis for the downgrading of wetland E1 is not sufficiently documented and should be re-evaluated based on extensive local knowledge and information.***

The designation for Wetland E1 was extensively reviewed and documented by Wetland Resources Inc. and the City's wetland consultant, Perteet, and ultimately approved by the MDRT (*see* Exhibits 28 (pgs. 178-206)). Such review was based on the Washington State Department of Ecology Wetland Rating System. *See* page 186 of Exhibit 28. Mr. Bortleson provides no explanation as to why such substantial documentation is insufficient.

- 10. The plan to "decommission" logging roads should be revised to require restoring them.***

Mr. Bortleson's above comment suggests that YarrowBay should be required to mitigate impacts not caused by Plat2C, but suggestion goes beyond the SEPA requirements, which obligate YarrowBay to mitigate only the impacts specifically caused by the project.

- 11. There is no evidence in the record that Perteet reviewed Wetland Resources April 28, 2014 memorandum.***

Perteet reviewed Wetland Resource's April 28, 2014 memorandum as documented in the follow-up memorandum dated May 19, 2014 (Exhibit 28e).

Comments on Golder response to Perteet's comment number 6:

- 1. Golder's response is wholly inadequate. Golder based its review on Triad's drainage analysis which was not intended to determine wetland impacts. Golder acknowledges the inadequacy of Triad's drainage analysis and recommends that an additional drainage review should be conducted later to account for any "subtle" changes. However, such a later analysis would not be subject to SEPA or plat hearing review, and should certainly not be limited to "subtle" changes.***

YarrowBay requested Golder review Mr. Bortleson's above comment and prepare a response that is attached hereto as Attachment 4. In summary, Golder did not conclude that Triad's drainage analysis was inadequate but that such drainage analysis should be updated to account for any design changes that occur between the level of design depicted in the Plat 2C preliminary plat approval and final engineering construction drawings.

Golder recommendeds that during final engineering review of Phase 2 Plat C, an update to the preliminary drainage analysis (using the same methodology as Triad previously completed) be conducted to account for any design changes from the preliminary plat design to the final engineering construction drawings. The prior reference to "subtle" changes was intended by Yarrow Bay to provide the community comfort that the only changes that are expected will be

subtle, not major. However, Yarrow Bay has recommended to the Examiner that the Staff Proposed Condition No. 13 also be revised to delete the word "subtle."

- 2. Golder acknowledges that the City does not use the best available science for doing hydroperiod analysis of wetlands, but offers no suggestion for how to address this deficiency.*

Please see Attachment 4 prepared by Golder and attached hereto in response to Mr. Bortleson's above comment. Golder's response to Perteet comment number 6 does not state that the City does not use the best available science. In fact, Golder explains that "the method that Triad presented is suitable for matching pre-developed to developed water inputs."

- 3. Golder's conclusion about "annual average recharge volume" ignores the issue of seasonal variations, changes in hydrologic regime cycles, changes during storm events and changes during the dry season.*

Please see Attachment 4 prepared by Golder and attached hereto in response to Mr. Bortleson's above comment. In summary, Triad has proposed to discharge an equivalent annual volume of surface water through a long linear level spreader at the buffer of the wetland. As described in Attachment 4, through the level spreader, runoff will attenuate and simulate the seasonal variation of the hydrologic regime for both storm events and dry times.

- 4. Neither Golder nor Triad utilized a qualified wetlands scientist to review potential impacts to the wetlands on site caused by their drainage plans.*

Contrary to Mr. Bortleson's above comment, Wetland Resources, Inc., YarrowBay's wetland consultant, reviewed the drainage plans drafted by Golder and Triad and any associated potential wetland impacts. Please see Attachment 2 attached hereto. In summary, Wetland Resources, Inc. concluded that there will not be a significant adverse impact to the hydrology of the on-site wetlands from the development of the Villages Phase 2 Plat C project.

- 5. There is no evidence in the record that Wetland Resources or Perteet reviewed Golder's memorandum.*

Please see Attachment 2 attached hereto in response to Mr. Bortleson's above comment. Wetland Resources, Inc., Triad Associates, and Golder Associates worked collaboratively throughout the planning and design process of Plat 2C to determine whether the proposed development activity would impact the hydrology of on-site wetlands. As such, Wetland Resources, Inc. has reviewed Golder's May 8, 2014 memorandum (Exhibit 28f) and agrees with the conclusion that there will be no substantial impact to wetland hydrology.

Comments on Sensitive Area Study, Buffer Averaging Plan, and Wildlife Analysis by Wetland Resources dated February 24, 2014 and revised May 6, 2014:

- 1. The report's average annual runoff tables are inconsistent with best available science. The runoff estimates for till forests, for example, are grossly overstated. This, in turn, minimizes the impact of clearing and grading those forests on wetlands and downstream drainage features.*

YarrowBay asked its civil engineering consultant, Triad, to review Mr. Bortleson's above comment and prepare a written response. Triad's responsive memorandum is attached hereto as Attachment 5. In summary, the average annual runoff tables provided in *The Villages MPD Preliminary Plat Phase 2 Plat C Preliminary Drainage Analysis* (Exhibit 20) are based on the *Environmental Impact Statement Technical Report on Geology, Soils and Ground Water* prepared by Associated Earth Sciences, Inc. (FEIS AESI Report) from Appendix D of *The Villages Master Planned Development Final Environmental Impact Statement* (Exhibit 12). The runoff table within the Sensitive Areas Study (Exhibit 28) was created by scaling the tables within Appendix 10 of the FEIS AESI Report (Attachment 9). Mr. Bortleson's allegations that such approach is inconsistent with best available science is unsubstantiated.

2. The report accepts the Triad water recharge/balance data without verification or any evidence of independent analysis.

Contrary to Mr. Bortleson's above comment, the Triad water recharge/balance data was in fact verified by a third-party. In its March 31, 2014 memorandum, the MDRT's third-party wetland consultant, Perteet, noted that they reviewed, among other things, the Sensitive Area Study, the Buffer Averaging Plan, the Wildlife Analysis and, specifically, *The Villages MPD Preliminary Plat Phase 2 Plat C Preliminary Drainage Analysis*. See Exhibit 28c.

3. The report merely "assumes" that the City's 2008 Best Available Science Review is adequate without any independent or more current review.

Wetland Resources Inc.'s reliance on the City's existing Best Available Science Review to analyze wetlands located on Preliminary Plat 2C within the Sensitive Area Study (Exhibit 28) is consistent with the City Code (BDMC Ch. 19.10) and state law (e.g., RCW 43.21C.240 and WAC 197-11-660). Further, contrary to Mr. Bortleson's above allegation, Wetland Resources Inc. did not limit itself only to sources provided by the City. As the Sensitive Area Study notes, "[a]dditional sources of BAS used in preparation of this Sensitive Area Report are cited in the 'Reference Section' of this document." (Exhibit 28, pg. 10). Finally, Perteet, the City's wetlands consultant, reviewed and approved of WRI's use of the City's Best Available Science resources, providing independent verification that such usage was appropriate (Exhibit 28c).

4. The Sensitive Area Study assumes that the Development Agreement's delineations are "final and complete" and does not even address wetland delineations. This is in violation of the City's code and other legal requirements. State law requires the City to apply applicable law, and also requires Development Agreements to comply with applicable law. Moreover, the Development Agreement itself includes language that contradicts its own "final and complete" language and suggests that more accurate delineations at the preliminary plat stage are appropriate.

As noted above, Section 8.2.1 of *The Villages MPD Development Agreement* states that the "wetland delineations outlined in the Constraints Map as surveyed on 7/27/09 are **deemed final and complete** through the term of this Agreement" (emphasis added). Mr. Bortleson's allegations that such "final and complete" provision in *The Villages MPD Development Agreement* violates the City Code and other legal requirements are unsubstantiated. Not only does Mr. Bortleson fail to identify the legal requirements supposedly violated, but his comment

constitutes a prohibited collateral attack. The provisions of The Villages MPD Development Agreement cannot be revisited in the context of the Plat 2C application review and hearing.

5. *The Sensitive Areas Study also assumes the adequacy of soil sampling without review.*

Contrary to Mr. Bortleson's above comment, the MDRT's independent wetland consultant, Perteet, reviewed the Sensitive Area Study (Exhibit 28c) and determined that Wetland Resources Inc.'s conclusions were appropriate (see Exhibits 28, 28e).

6. *The report presents no new analysis or survey data regarding wildlife habitat. The report dismisses the presence of significant, threatened and endangered species despite extensive local knowledge of the presence of such species and the obvious suitability of the site's habitat areas to accommodate them.*

Contrary to Mr. Bortleson's above comment, the Sensitive Areas Study, Buffer Averaging Plan, and Wildlife Analysis prepared for The Villages Phase 2 – Plat C, revision dated May 6, 2014 (Exhibit 28) does reference a detailed wildlife analysis conducted by Wetlands and Wildlife, Inc. in a report titled, *Wildlife Habitat Assessment Report – The Villages MPD Phase 2 Preliminary Plat C*, dated February 21, 2014 (Exhibit 28, pgs. 165-175). This report is based on site and habitat evaluations conducted on The Villages Phase 2 Plat C project area.

YarrowBay would also note that the report was written by a professional Biologist/Ecologist with 17 years of experience, 13 of which have been in western Washington, who studied the Plat 2C site and determined that the mitigation measures undertaken by YarrowBay will be adequate to maintain habitat areas for wildlife that are currently living on site. The report notes that the professional biologist specifically studied the Preliminary Plat 2C site, compiled additional findings that are specific to the site, and made his recommendations pursuant to Section 19 of the Black Diamond Municipal Code. Moreover, as with the documents above, Perteet, the City's consultant, reviewed the Wildlife Habitat Assessment Report and determined that it was sufficient to meet the City's preliminary plat requirements (Exhibit 28c).

Comments on Geotechnical Report:

1. *The groundwater analysis was done during the driest time of the year, early September.*

Golder has prepared a response to this comment attached hereto as [Attachment 4](#). In summary, groundwater conditions were described in the Phase 2 Plat C Geotechnical Report (Exhibit 23a). The purpose of groundwater conditions description in the Geotechnical Report was to illustrate that shallow groundwater was not encountered in the test pits or monitoring wells installed on the Plat 2C site. The 2013 soil test pits excavations occurred in early September. However, there have been previous excavations within or adjacent to the site boundary and groundwater levels have been monitored in piezometers installed in several of those test pits. For example, a piezometer was completed in TP-117 in 2010. Numerous water level measurements have been made in that test pit, including winter/spring measurements from 2011 through 2014. Groundwater levels at TP-117 have been at least 21 feet below ground surface (bgs) in each measurement.

2. *The soil tests were shallow and didn't cover most of the site.*

According to Attachment 4 attached hereto, prepared by Golder, the soil test pits were generally excavated to 5-10 feet bgs to evaluate shallow sub-surface conditions. However, Test Pit TP-117 was completed to a depth of 20 feet bgs, TP-36 was completed to a depth of 18 feet bgs, and monitoring well MW-31 was completed to a depth of 36 feet bgs. The use of test pits to evaluate subsurface conditions was appropriate for Plat 2C. The test pits confirmed the presence of compact to dense native soils suitable for shallow spread footing foundations.

3. *There is no basis offered for the selection of pit locations.*

Please see Attachment 4 attached hereto prepared by Golder. In summary, test pit locations were selected by Golder and distributed across the site to confirm local geology and provide geotechnical information for design.

Exhibit 11: Public Comment: Brian A. Borgstadt, Covington Water District (letter, August 5, 2014)

The City of Black Diamond is the water purveyor for Plat 2C as shown in the City's Comprehensive Plan and the South King County Coordinated Water Service Plan. As shown on Attachment 6 (attached hereto), the 98-acre disputed water service area within The Villages MPD, to which Covington Water District references in its comment letter dated August 5, 2014, is not located within or adjacent to Plat 2C. Moreover, water service to Plat 2C does not run through the 98-acre water disputed area. Therefore, Covington Water District's letter is wholly irrelevant to the Hearing Examiner's review of Plat 2C.

Exhibit 50: Public Comment: Kristen Bryant (emails with attachment, July 1, 2014)

A. Insufficient Evidence to Justify Rating Category for Segment of Wetland E1.

The designation for Wetland E1 was extensively reviewed and documented by Wetland Resources, Inc. and the City's wetland consultant, Perteet, and ultimately approved by the MDRT (*see* Exhibits 28 (pgs. 178-206). In addition, YarrowBay asked Wetland Resources, Inc. to review all of Mr. Bryant's comments in her July 1, 2014 correspondence and prepare a written response. Wetland Resources, Inc.'s response is set forth in Attachment 2 attached hereto. In summary, a detailed topographic and sub-basin analysis was conducted by Triad and Associates to determine contributing basins of Wetland E1 and the directions of flow within the Wetland. These analyses lead Wetland Resources, Inc. to the clear conclusion that the hydrology in Wetland E1 flows to the northwest, away from the Core complex associated with Rock Creek. This flow pattern is readily discernable in the field and was observed during one of the multiple site visits conducted by Wetland Resources, Inc. and Perteet, the City's wetland consultant.

B. Interpretation of Ecology Guidance.

See Wetland Resources, Inc.'s written response to this comment in Attachment 2 included herewith. In summary, YarrowBay through its consultants and as vetted by the City's MDRT, has demonstrated a clear break in the direction of flow within Wetland E1. This determination was made through a formal topographic survey and readily observable field conditions. The Washington State Department of Ecology Wetland Rating System for Western Washington,

Ecology Publication #04-06-025, August 2004, states that “The guiding principle for separating a vegetated wetland into different units for the purposes of rating is changes in the water regime of the wetland. Boundaries between different units should be set at the point where the volume, flow, or velocity of the water changes abruptly, whether created by natural or human-made feature.” In the situation of Wetland E1, an abrupt change in the water regime is readily apparent, identifiable, and defensible due to natural topographic change. At this surveyed topographic location, a drainage basin break occurs with a portion of the water flowing south and east into the Core complex and a portion flowing north and west into the body of Wetland E1. This topographic drainage basin break is the location of the segregation of the Wetland E1 unit and the Core complex unit. Detailed monitoring of hydrology is not necessary when a detailed topographic survey is available that depicts this break and when the opposing directions of flow are observable in the field.

C. Wetland E1 Part of Core Wetlands Complex.

See YarrowBay’s response in subsection (B) above as well as Wetland Resources Inc.’s written response in Attachment 2 included herewith.

D. Unclear SEPA Designated Official.

The final decision regarding the classification of Wetland E1 was made pursuant to the Hearing Examiner’s condition of approval no. 87 for Preliminary Plat 1A:

[T]he City’s MDRT team shall re-evaluate the Class II designation for Wetland E1 on the basis of whether Wetland E1 was properly segregated under the guidelines of the City’s adopted and applicable wetland classification manual. The re-evaluation shall be completed prior to conducting any activities within Wetland E1 or its buffers that would be prohibited in a Class I wetland and no later than issuance of the first certificate of occupancy for a PPIA dwelling unit.

Based on this condition, YarrowBay and its consultants submitted follow-up materials to the City’s MDRT following the approval of The Villages Preliminary Plat 1A (*see* Exhibit 28 at pgs. 181-189) and the MDRT approved the segregation and classification of Wetland E1 on (*see* Exhibit 28 at p. 178). The Villages Preliminary Plat 1A Condition of Approval No. 87 did not require that the SEPA Designated Official approve the Wetland E1 re-evaluation; instead it noted that that the “MDRT team” should complete such review. The persons signing the Wetland E1 approval (Exhibit 28, pg. 178) were the members of the MDRT at the time the approval was issued, rendering their approval in full compliance with The Villages Preliminary Plat 1A Condition of Approval No. 87.

E. Wetland Buffer Should Be Increased.

See YarrowBay’s responses to subsections (A), (B), and (C) above.

F. Density of Development Along Wetland Buffer May Be Higher Than Allowed.

Ms. Bryant's above comment appears to allege that the Plat 2C residential density proposed for the areas surrounding Wetland E1 violate some undefined section of the Black Diamond Municipal Code or unnamed professional guidance. The density in parcel V28, which is the parcel that borders Wetland E1, is 5.81 units/acre, not 8 units/acres as alleged in Bryant's comments. YarrowBay is unaware of any City code provision that limits the density surrounding Wetland E1 to something below the density provided in Plat 2C.

G. Wetlands Shown As Isolated May Be Connected.

Please see Attachment 2 prepared by Wetland Resources Inc. and attached hereto in response to Ms. Bryant's above comment.

H. The City Should Place as a condition on the Plat the requirement of Army Corps wetlands delineation verification of before clearing and grading begins on the plat.

There is no basis in City Code, State law, or the record to request a Jurisdictional Determination from the US Army Corps of Engineers (Corps), since no impacts are proposed to any Waters of the State by Plat 2C. If, as part of any future phase of The Villages MPD, YarrowBay proposes impacts to Waters of the State, preconstruction notification will be provided to the Army Corps as required by the Clean Water Act. Moreover, BDMC 19.10 (the City's Sensitive Areas Ordinance) does not require that wetland ratings be reviewed and/or approved by the Army Corps.

I. Buffer Averaging Plan Does Not Improve Protection.

There is no evidence in the record to support Ms. Bryant's allegation set forth above. See Wetland Resources Inc.'s comprehensive response to this allegation at Attachment 2 as well as the Buffering Averaging Plan by Wetland Resources Inc. (Exhibit 28a). Contrary to Ms. Bryant's allegation, YarrowBay submitted a wetland buffer width averaging plan pursuant to BDMC 19.10.230(H) for Wetland E1 that will improve the protection afforded by the current buffer widths. YarrowBay requested to be allowed to take small portions of the existing buffer (a maximum of eight feet in width from one point in a 110-foot buffer) and opted to allow much larger areas, in more sensitive locations, to be classified as buffer area. In all, YarrowBay requested to be allowed to use 2,117 square feet of current buffer area and offered to put 26,222 square feet of land into the buffer area. This averaging plan, which former Mayor Gordon approved on June 5, 2014 (Exhibit 30a), results in a net gain of 24,105 square feet, or more than one half of an acre, of additional buffer area. Moreover, the land that YarrowBay has suggested putting into the buffer area is in locations that are currently more sensitive, meaning this will provide greater protection for Wetland E1. By allowing this land to be used as buffer area, YarrowBay has qualitatively increased the protection for Wetland E1, in addition to quantitatively increasing the buffer area.

J. Possible Tributary Stream to Rock Creek Not Addressed.

Please see Attachment 2 prepared by Wetland Resources Inc. and attached hereto in response to Ms. Bryant's above comment.

K. Wildlife Habitat.

Please see Attachment 3 attached hereto in response to Ms. Bryant's comment regarding steelhead trout. In summary, as stated in Ms. Bryant's email dated July 1, 2014, Puget Sound DPS steelhead trout are listed as a Threatened species. However, Plat 2C does not include any impacts to Rock Creek or any open water associated with the wetland areas associated with Rock Creek. Further, Rock Creek and the associated wetland areas are regulated and protected as a Core Stream and Wetland Complex by the City of Black Diamond's sensitive areas ordinance. Therefore, Rock Creek, wetland areas, and associated protective buffers will be protected in perpetuity and Plat 2C does not include any proposed impacts to the Core Stream and Wetland Complex or buffer areas. Based on this information, Plat 2C will not create any adverse impacts on steelhead trout.

Exhibit 51: Public Comment: Judith Carrier (letter, July 1, 2014)

MPD Conditions of Approval that are not properly applied to the Plat 2C:

- 1. Condition of approval number 9 is not noted on the Plat and should be in order to inform purchasers of lots.***

Please refer to footnote 1 above. The Villages MPD Conditions of Approval as set forth in Exhibit C to Black Diamond Ord. 10-946 and incorporated into The Villages MPD Development Agreement as Exhibit "C" are independently applicable to each implementing project of The Villages MPD (e.g., Plat 2C) and do not need to be restated in the project-specific conditions of approval to be effective. Notwithstanding the foregoing, see the Staff Report's recommended condition of approval 9 that requires the inclusion of certain provisions within the CCRs for Plat 2C.

- 2. Condition of approval number 21 requires the development of a street grid system, but the plat utilizes a single access system and other design approaches that are inconsistent with a grid system.***

Please see the Staff Report's response to MPD Condition of Approval No. 21 on page 50. Roads A, B, and C provide the main NW to SW access to Plat 2C while the alleys and woonerfs connect them in a modified grid. Plat 2C meets this MPD condition. In addition, please see YarrowBay's traffic consultant's response to this comment attached hereto as Attachment 7.

- 3. Condition of approval number 30 requires measures to reduce speeds on neighborhood streets. The measures employed are not adequate to achieve this result. There are long straight-aways and no mention of measures such as speed bumps or roundabouts that would slow traffic. Instead, the straight roads look like racetracks for people pulling out of small alleys late to work.***

Please see the Staff Report's response to MPD Condition of Approval No. 30 at page 51. Moreover, please see YarrowBay's traffic consultant's response to this comment attached hereto as Attachment 7. In summary, traffic calming is intended to reduce vehicle speeds, improve

safety, and enhance quality of life. In addition to the fact that Plat 2C is designed with 10-foot wide travel lanes on residential streets, YarrowBay has also proposed to provide curb bulb-outs and on-street parking to calm traffic and help minimize excessive vehicle speed in Preliminary Plat 2C.

YarrowBay has proposed curb bulb-outs at 13 different intersections and curb bulb-outs at two mid-block locations. Curb bulb-outs help delineate on-street parking and provide for safer pedestrian crossing movements at internal intersections as well as at major pedestrian crossing points. Curb bulb-outs narrow the roadway to promote slower vehicular speeds and allow shorter pedestrian crossing distances, reducing exposure of pedestrian/vehicle conflicts.

As an example, in Plat 2C pavement width is reduced at the intersection of Road A and Road C. This reduction in width will slow traffic and help allow for a safer pedestrian passage across the intersection. Pavement width is also reduced where Alley D intersects with Roads A and C, again providing a traffic calming measure. Similarly, pavement width is reduced where the pedestrian trail in Tract 902 crosses Road A, thereby slowing traffic and providing safer pedestrian passage. These three examples of the use of curb bulbs are replicated throughout Plat 2C.

In addition to curb bulb-outs, all residential streets within Plat 2C will utilize on-street parking on both sides of the street, and each Woonerf will allow parking on one side of the street. On-street parking has a measurable effect on vehicle speeds. Motorists generally travel at slower speeds in the presence of on-street parking because of the possibility of motorists entering/exiting the flow of traffic, which requires more attentive driving behavior and slower speeds, and because parked vehicles give the perception of narrower travel lanes, which reduces vehicular speeds.

- 4. Condition of approval number 60 states that stormwater designs "shall include low impact development techniques wherever practical and feasible" but the plat conditions include no provisions to accomplish this. Techniques such as permeable pavement on road and walkways have not been considered even though these have been found to be both "practical and feasible".***

See the Staff Report's recommended condition of approval 77. This recommended condition requires the use of low impact development techniques in Plat 2C where feasible. *See also Attachment 5* containing Triad's response to Ms. Carrier's above comment.

- 5. No consideration has been given to the reduction of runoff from individual lot landscaping.***

YarrowBay asked its civil engineering consultant, Triad, to review Ms. Carrier's above comment. Please see Triad's response attached hereto as Attachment 5. In summary, the reduction of runoff from lot landscaping is not a condition of either The Villages MPD or The Villages MPD Development Agreement. In addition, the treatment of lot landscaping is typically dealt with during the construction plan phase when those details are specified. It is likely that re-use of topsoil strippings within the Plat2C site will result in a greater depth of topsoil than in the existing condition. This will help reduce runoff from lot landscaping by

providing a zone for the absorption of runoff. Again, this will be dealt with in detail when applying the City drainage code to the preparation of the final construction plans for Plat 2C.

- 6. *Condition 64 requires native plantings and minimization of lawns, but is not noted or applied to the Plat. There is no mechanism to enforce this SEPA applied condition.***

Please see footnote 1 above, as well as the Staff Report's response to MPD Condition of Approval No. 64 at page 22. This condition will be enforced with utility or building permit applications for Plat 2C.

- 7. *Plat condition number 13 specifically contradicts provisions of the MPD approval regarding the requirement to use Low Impact Development by stating that: "Areas outside of sensitive areas and their buffers are anticipated to be cleared ... " Merely applying the City's tree code to these areas does not comply with low impact development requirements.***

YarrowBay is unclear as to what "plat condition number 13" Ms. Carrier's above comment is referring to or how clearing outside of sensitive areas is a violation of low impact development. The requirement to use low impact development techniques where feasible in the development of The Villages MPD does not prohibit the clearing of development areas. Instead, low impact development techniques are required to be applied to such cleared areas as set forth in the Staff Report's recommended condition of approval 77.

- 8. *Condition 71 requires a "proactive erosion and sediment plan" and a "response plan". The Plat has not been conditioned to meet this condition.***

Please see footnote 1 above. In addition, the Staff Report's recommended conditions of approval 6 and 14 require compliance with the 2005 Stormwater Management Manual for Western Washington and current NPDES permits issued to the City of Black Diamond by the Washington Department of Ecology. Such compliance will also require the submittal and approval of a Temporary Erosion and Sedimentation Control, or TESC, plan by YarrowBay for Plat 2C.

- 9. *Condition 76 specifically requires updated phosphorus control methods "even if the Applicant's ponds and facilities would otherwise be vested to a lower standard". The Plat does not meet this requirement and there is no evidence in the record that the Applicant's or City's consultants were informed about this condition or were directed to identify and apply such additional methods.***

Please see the Staff Report's recommended condition of approval 11, which requires as a condition of the City's approval of the first utility permit for Plat 2C, that YarrowBay provide sufficient information to the City to identify any AKART opportunities for phosphorous reduction. Please also see Triad's response to this comment attached hereto as [Attachment 5](#).

- 10. *Condition 85 requires the Water Quality Review Committee to "review and evaluate compliance with the stormwater conditions imposed upon the Villages MPD". There is no evidence in the record that the Committee reviewed the Plat for compliance. Only***

the annual report was reviewed, but not in the context of compliance with stormwater regulations and standards.

Please see the Staff Report's response to compliance with MPD Condition of Approval No. 85 at pages 27 through 28. Condition 85 does not require that the Water Quality Review Committee review plat applications for compliance with The Villages MPD Conditions of approval prior to their approval by the Hearing Examiner. Instead, the Water Quality Review Committee reviews The Village MPD as a whole and its compliance with the MPD Conditions of Approval on an annual basis. In this context, the Water Quality Review Committee will be reviewing Plat 2C's compliance with the MPD Conditions of Approval related to water quality in 2015.

11. Condition 95 requires construction or bonding of on-site trails "prior to occupancy, final site plan, or final plat approval, whichever occurs first". There is no Plat condition to require this.

Please see the Staff Report's recommended condition of approval 66: ". . . All trails will be constructed or bonded prior to final plat approval."

12. Condition 101 requires fire access roads to comply with the International Fire Code. The Plat configuration for road access does not comply with this requirement.

See the Staff Report's response to The Villages MPD Condition of Approval No. 101 at page 166. See also Triad's response to this comment at Attachment 5. The Black Diamond Fire Department reviewed the access roads proposed for Plat 2C and found that the roads meet International Fire Code (IFC) requirements (Exhibit 40), with the recommended conditions of approval 30 and 31 to prohibit parking on all 20-foot alleys and to ensure all roads maintain a 20 foot unobstructed driving surface.

13. Condition 104 authorizes limiting earth moving and grading to the dry season. There is no evidence in the record that staff considered applying this condition.

See footnote 1 above. This condition will be applied at time of clearing and grading permit review.

14. Condition 118 is a SEPA applied condition to provide "on the ground" protection measures for wetland buffers and significant trees, but no requirement other than tagging has been required as a Plat condition.

Please see the Staff Report's recommended conditions of approval 38, 39, 42, 44, and 72. Each of these recommended conditions contain "on the ground" protection for wetland buffers and significant trees within Plat 2C.

15. Condition 122 requires native vegetation in street landscaping, but no Plat condition accomplishes this.

Please see footnote 1 above. This condition will be applied by City Staff as the time of landscaping plan review for Plat 2C.

16. Condition 124 requires review of landscape plans by the City's Director of Natural Resources and Parks, but no Plat condition accomplishes this, and there is no evidence in the record that this review has been done.

Please see footnote 1 above. This condition will be applied by City Staff as the time of landscaping plan review for Plat 2C. Landscape plans for Plat 2C have not yet been submitted for approval to the MDRT.

17. Condition 125 requires a 300 foot wildlife corridor that has not been considered by the Plat review.

The 300-foot wildlife corridor referenced in The Villages MPD Condition of Approval No. 125 refers to the reserved 300-foot corridor located to the southwest, south, and east of Plat 2C the shown on The Village MPD's constraint maps (Exhibit "G"). As such, this MPD Condition of Approval has already been satisfied by The Villages MPD as a whole and is inapplicable to Plat 2C individually.

18. Conditions 126 and 143 authorize building design to include solar, wind, and other renewable sources, but this condition has not been listed on the Plat.

See the Staff Report's recommended condition of approval 2 that requires a provision within Plat 2C's CCRs allowing the use of green technologies such as solar panels. The Villages MPD Conditions of Approval will also be applied by the City at the time of building permit review.

19. Condition 129 regarding a mix of housing types has not been applied to the Plat.

See the Staff Report discussion of The Villages MPD Condition of Approval No. 129 at pages 133 through 134. City staff notes that this condition will be enforced through design review by YarrowBay's Design Review Committee and site plan review by the MDRT as the building permit stage.

20. Condition 142 requires single family dwelling units to be alley loaded, but the Plat does not properly apply this condition.

See the Staff Report discussion of The Villages MPD Condition of Approval No. 142 at page 136. City staff notes that Plat Sheet CV3 (Exhibit 2) contains a Lot Summary table with detail regarding whether garages will be front or alley loaded. The condition requires that "[d]etached single family dwelling units shall be alley loaded, except where site conditions prevent alley loading or cause alleys to be impractical as determined by the City, in its reasonable discretion." Here, the width of Plat 2C is constrained by buffers of wetlands and Rock Creek that renders alleys (in some cases) impractical because they would create more pollution-generating surfaces immediately adjacent to sensitive areas. Therefore, City staff determines that Plat 2C meets the requirements of The Villages MPD Condition of Approval No. 142.

- 21. Condition 164 requires submission and City approval of a "detailed implementation schedule of the regional projects supporting that phase". This approval is a legislative approval that is separate from the approval of the Plat and must be consistent with the City's capital plan. No such approval has been obtained.*

The Detailed Implementation Schedule for Phase 2 Regional Infrastructure Improvements was approved by the City on June 13, 2014 See Exhibit 29.

Subdivision Code Requirements that are not properly applied:

- 1. The internal road circulation system is not well- documented and is not fully consistent with traffic design standards.*

Please see Attachments 5 and 7 attached hereto from YarrowBay's consultants Triad and Transpo. There is no evidence in the record to support Ms. Carrier's allegations that the road circulation system is not consistent with traffic design standards.

- 2. In an apparent attempt to comply with the 150 -unit limit for a single point of access, a substandard second access is proposed that does not meet traffic design standards.*

Please see the Staff Report's response to The Villages MPD Condition of Approval No. 27 on page 51. There are two access points to the Plat 2C development via Road A and Woonerf A. There is no evidence in the record that such connection points do not meet traffic design standards. To the contrary, please see Attachments 5 and 7 attached hereto.

- 3. Adequate provision for stormwater treatment has not been made because the receiving stormwater facility has not been designed and approved by the City.*

Please see the Staff Report at pages 19 through 28. Runoff from pollution-generating surfaces within Plat 2C will be routed through a new storm drainage system to the stormwater pond and infiltration facility in the approved Preliminary Plat 1A to the west. The Staff Report's recommended conditions of approval require that these Preliminary Plat 1A facilities be in place and operational prior to the approval of the first utility permit for Plat 2C, which enables impervious surface construction. See Staff Report recommended condition of approval 7. Therefore, adequate provision for Plat 2C stormwater has been made. Further, there is no provision of the Black Diamond Municipal Code or Washington State law that requires stormwater facilities serving a subdivision to be designed and approved prior to preliminary plat approval.

- 4. Adequate provision for sewer has not been made because the required regional conveyance system has not been designed and constructed. Plat review requires a finding of adequate sewer capacity notwithstanding provisions in the Development Agreement that establish a threshold of 1150 ERUs before storage is required.*

Please see the Staff Report's recommended conditions of approval 52 and 53 that require completion of an interim sanitary sewer lift station and offsite sewer system prior to the approval of first building permit for any Plat 2C structure that might discharge wastewater into the utility system and prior to final plat approval, respectively. With these conditions in place, City staff determined that adequate provision for Plat 2C sewer has been made. See Staff Report at pages 91 through 101.

5. *Adequate provision for school services has not been made because there is no information in the record that documents adequate school capacity. Reliance on the Tri-Party Agreement is not sufficient to verify available school capacity at the time of subdivision. Moreover, the Agreement's funding plan is based on incorrect assumptions and is not achievable.*

Please see the Staff Report at pages 114 through 116. See also the comprehensive response to Cindy Proctor above regarding Enumclaw School District-related issues. The Villages MPD Condition of Approval No. 98 provides that the Comprehensive School Mitigation Agreement ("CSMA") provides for "adequate mitigation of impacts to school facilities" and the CSMA itself provides that it serves as complete mitigation for all school impacts. There is no evidence in the record to support Ms. Carrier's allegations that the CSMA's funding plan is based on incorrect information or that it is not achievable. YarrowBay remains obligated to pay school mitigation fees for Plat 2C pursuant to its terms.

Exhibit 52: Public Comment: Erika Morgan (email and attachment, December 4, 2014)

Please see Attachment 8 prepared by Golder and attached hereto in response to Ms. Morgan's above comment.

Attachments List

- 1) Tetra Tech Letter Regarding Response to Preliminary Plat 2C Public Comments
- 2) Wetland Resources, Inc. Memorandum Regarding Response to Public Comments on The Villages MPD Phase 2 Plat C
- 3) Wetlands & Wildlife, Inc. Memorandum Regarding Response to Public Comments Regarding Fish and Wildlife Habitat The Villages MPD Phase 2 Preliminary Plat C
- 4) Golder Associates Memorandum Regarding Response to Public Comments on Preliminary Plat 2C
- 5) Triad Associates Memorandum Regarding The Villages – Preliminary Plat 2C Public Comments
- 6) Covington Water District Disputed Area Exhibit
- 7) Transpo Group Memorandum Regarding The Villages MPD – Phase 2 Plat C, Response to Public Comments
- 8) Golder Associates Memorandum Regarding Response to E-Mail Complaint of Silt in Water Well By Ms. Erika Morgan
- 9) Appendix 10 (Water Tables) to FEIS Appendix D

Attachment 1

Tetra Tech Letter Regarding Response to Preliminary Plat 2C Public Comments

Attachment 2

Wetland Resources, Inc. Memorandum Regarding Response to Public Comments on The Villages MPD Phase 2 Plat C



December 5, 2014

City of Black Diamond
Attn: Andy Williamson, Economic Development Director
PO Box 599
Black Diamond, WA 98010

Re: Response to Public Comments on The Villages MPD Phase 2 Plat C

Dear Mr. Williamson,

Please find below quoted public comments in bold regarding *The Villages MPD Phase 2 Plat C*, followed by the *Wetland Resources, Inc.* (WRI) response. Only comments specific to WRI reports are discussed.

Kristen Bryant Comments:

1. Insufficient Evidence to Justify Rating for Segment of Wetland E1

A detailed topographic and sub-basin analysis was conducted by Triad and Associates to determine contributing basins of Wetland E1 and the directions of flow within the Wetland. These analyses lead to clear conclusion that the hydrology in Wetland E1 flows to the northwest, away from the Core complex associated with Rock Creek. This flow pattern is readily discernable in the field and was observed during one of the multiple site visits conducted by Wetland Resources, Inc. and Pertect.

2. Detailed concerns and evidence regarding Wetland E1

The Applicant, through its consultants and as vetted by the City MDRT, has demonstrated a clear break in the direction of flow within Wetland E1. This determination was made through a formal topographic survey and readily observable field conditions. The Washington State Department of Ecology *Wetland Rating System for Western Washington*, Ecology Publication #04-06-025, August 2004, states, "The guiding principle for separating a vegetated wetland into different units, for the purpose of rating, is changes in the water regime of the wetland. Boundaries between different units should be set at the point where the volume, flow, or velocity of the water changes abruptly, whether created by natural or human-made features." In the situation of Wetland E1 an abrupt change in the water regiment is readily apparent, identifiable, and defensible due to natural topographic change. At this surveyed topographic location, a drainage basin break occurs within a portion of the water flowing south and east into the Core complex

and a portion flowing north and west into the body of Wetland E1. This topographic drainage basin break is the location of the segregation of the Wetland E1 unit and the Core complex unit. Detailed monitoring of hydrology is not necessary when a detailed topographic survey is available that depicts this break and when the opposing directions of flow are observable in the field. Given that Wetland E1 is a separate and distinct wetland unit from the Core complex, it should have a 110-foot buffer as is required for a moderate habitat score (between 20 and 28) Category III wetland.

The public comment also suggests that an increased buffer per the provisions of BDMC 19.10.230 is necessary and/or appropriate for Wetland E1. While the Wetland E1 unit is adjacent to Wetland TOS (Core complex), it is separate and distinct. An additional 115-foot buffer (totaling 225 feet), would not provide any additional protection to the functions and values of the Core Wetland Complex due to this disconnect. Therefore, as a qualified professional wetland scientist, I do not believe a buffer increase for Wetland E1 is necessary. In addition, the buffer associated with all the on-site wetlands is driven by requirements established in BDMC 18.10.230, which designates buffers based on Category and Habitat Score rather than the density of adjacent development. Therefore, under BDMC 19.10, the density of adjacent development is not germane to this buffer discussion.

3. Wetlands shown as isolated may be connected

None of the information listed in the plat documents identifies or infers that Wetland E8, E10, and/or Wetland 213 are connected. In fact, data taken outside of these wetlands clearly indicates non-wetland conditions and is also representative of the non-wetland conditions surrounding the aforementioned Wetlands (see data sites S3, S5, and S7). Furthermore, these wetlands are located in shallow depressions with distinct boundaries defined by vegetation, soils, and hydrology, which all change rather dramatically at the interface between the wetland and non-wetland conditions.

As part of review of the Villages Phase 2 Plat C application, Jason Walker, PWS from Perteet, evaluated and agreed with the wetland rating forms for the on-site wetlands. Of particular interest within the rating forms for Wetland E8, E10 and 213 is the answer to question DI, which states “The unit is depression with no surface water leaving the wetland.” This, along with the collected data reviewed and approved by Perteet confirms the isolated nature of these wetlands.

4. Possible Tributary to Rock Creek not addressed

No tributary has been observed exiting the north end of Wetland E1 flowing toward Rock Creek during any of numerous site visits that have been conducted as part of the field work that was done for the Villages MPD, The Villages Preliminary Plat 1A, and The Villages Phase 2 Plat C, nor has there been any comment from Perteet regarding the presence of a tributary connecting these two features. In addition, topography at the north end of Wetland E1 has a general south aspect, meaning any tributary would have to flow uphill before entering Wetland TOS. This tributary was not addressed in the Sensitive Area Study for the Villages Plat 2C, because actual detailed on-site investigations and review of available topographic information indicate that there is no stream present. The BAS map is in error where it depicts a tributary stream exiting the

north end of Wetland E1. This has been documented through multiple site visits, topographic and basin information. In addition all critical area boundaries have been formally established as part of the approval of the Villages MPD Development Agreement.

Gil Bortleson – Comments on Golder response to Perteet’s comment number 6

- 4. Neither Golder nor Triad utilized a qualified wetlands scientist to review potential impacts to the wetlands on-site caused by their drainage plans.**

I am a Society of Wetland Scientists Certified Professional Wetland Scientist with over 20 years experience working primarily in western Washington and clearly meet the definition of *Qualified Professional* in BDMC 19.10.646.

As noted in the *Sensitive Areas Study, Buffer Averaging Plan, and Wildlife Analysis - The Villages Phase 2 – Plat C*, revision dated May 6th, 2014, I reviewed the Water Recharge/Water Balance analysis prepared by Triad Associates (excerpted in the body of the report), and will restate that it is the opinion of WRI that there will not be a significant adverse impact to the hydrology of the on-site wetlands from the development of the Villages Phase 2 Plat C project.

- 5. There is no evidence in the record that Wetland Resources or Perteet reviewed Golder’s memorandum.**

WRI, Triad Associates, and Golder Associates worked collaboratively throughout the planning and design process to determine the potential for the proposed development activity impacting the hydrology to the on-site wetland. Therefore, WRI has reviewed Golder Associates’ May 8, 2014 memorandum and agrees with the conclusion that there will be no substantial impact to wetland hydrology.

Gil Bortleson – Comments on Sensitive Area Study, Buffer Averaging Plan and Wildlife Analysis by Wetland Resources dated February 24, 2014 and revised May 6, 2014:

- 6. The report presents no new analysis or survey data regarding wildlife habitat. The report dismisses the presence of significant, threatened and endangered species despite extensive local knowledge of the presence of such species and the obvious suitability of the site’s habitat areas to accommodate them.**

The *Sensitive Areas Study, Buffer Averaging Plan, and Wildlife Analysis prepared for The Villages Phase 2 – Plat C*, revision dated May 6th, 2014 does reference a detailed wildlife analysis conducted by *Wetlands and Wildlife, Inc.* in a report titled, *Wildlife Habitat Assessment Report – The Villages MPD Phase 2 Preliminary Plat C* dated February 21, 2014. This report is based on site and habitat evaluations conducted on The Villages Phase 2 Plat C project area.

Cynthia Wheeler Comments – July 1, 2014

- 1. There should be some concern about the archeological shovel probe activity near Rock Creek with regard to the listing of the Puget Sound Steelhead (*O. mykiss*) as a**

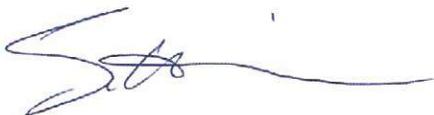
threatened species by the National Marine Fisheries Service and the January 2013 map of Proposed Critical Habitat for Puget Sound Steelhead identifying the entire Rock Creek System, within the City of Black Diamond, as this species' critical habitat. The release of phosphorous and/or silting into Rock Creek would certainly compromise this "species' critical habitat" and should also require review by the WA State Dept. of Fish and Wildlife. (National Marine Fisheries Services in the September, 2008 version of the Federal Register and January, 2013 map of Proposed Critical Habitat for Puget Sound Steelhead published in the Federal Register.) (This data is also noted by the City of Black Diamond's Natural Resources Director in the attached City correspondence.)

Based on conversations with Historical Research Associates, Inc., the project archeologist, site investigation work will be limited to proposed developed area and potential areas surrounding the proposed pedestrian trail. A total of between 5 to 10, 1.5-foot diameter by 3-foot deep holes per acre, will be dug by hand throughout the developed portion of the site. No test pits will be conducted within the buffer, east of the proposed pedestrian trail. Therefore the holes will have an almost 225-foot dense natively vegetated buffer between them and the Rock Creek wetland system. It is the opinion of WRI that this minor site investigation work will not impact Wetland TOS, Rock Creek, or any associated fish habitat.

Thank you for your time and careful review of this project. If you have any questions or need further information regarding this project, please feel free to contact me at 425.337.3174.

Sincerely

Wetland Resources, Inc.

A handwritten signature in blue ink, appearing to read 'S. Brainard', with a long horizontal flourish extending to the right.

Scott Brainard, PWS
Principal Wetland Ecologist

Attachment 3

**Wetlands & Wildlife, Inc. Memorandum Regarding Response to Public Comments
Regarding Fish and Wildlife Habitat The Villages MPD Phase 2 Preliminary Plat C**



**RESPONSE TO PUBLIC COMMENTS
REGARDING FISH AND WILDLIFE HABITAT
THE VILLAGES MPD PHASE 2 PRELIMINARY PLAT C
LOCATED IN THE CITY OF BLACK DIAMOND, WASHINGTON**

PREPARED FOR:

Wetland Resources, Inc.
9505--19th Avenue SE; Suite 106
Everett, WA 98208

PREPARED BY:

Wetlands & Wildlife, Inc.
7721—153rd Street SE
Snohomish, Washington 98296
(425) 337-6450

December 3, 2014

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INTRODUCTION AND BRIEF SITE DESCRIPTION

Wetlands & Wildlife, Inc. was retained as a sub-contractor to *Wetland Resources, Inc.* for the purpose of completing a Wildlife Habitat Assessment on the subject property (The Villages MPD Phase 2 Preliminary Plat C site). The previous Wildlife Habitat Assessment was completed to determine if any wildlife habitat used by special status wildlife species exists on the subject site on 11/27/2013 and 11/29/2013. An additional on-site wildlife habitat assessment was conducted on 9/17/2014 in response to public comments provided to the City of Black Diamond by Ms. Erika Morgan and Ms. Kristen Bryant. The letters provided by Erika Morgan and Kristen Bryant as public comments pertain to certain fish and / or wildlife species that Ms. Morgan and Ms. Bryant think may be located on the subject property and may be impacted by the proposed project. Therefore, this additional assessment was completed in conjunction with analyzing habitat characteristics specific to the fish and wildlife species noted in Ms. Morgan's and Ms. Bryant's public comments related to this project. The review area for the previous and current habitat assessment encompasses the areas within The Villages MPD Phase 2 Preliminary Plat C boundary.

Site access to the subject property is gained from Roberts Drive, an existing public roadway, located northwest of the subject property. Per information gained from The Villages MPD Phase 2 Plat C Preliminary Plat Project Narrative dated November 8, 2013, the Villages MPD Phase 2 Plat C preliminary plat site is located approximately 1.3 miles west of the intersection of Roberts Drive and SR 169, south of Roberts Drive. The preliminary plat site is located generally within the southeast quarter and portions of the southwest quarter of Section 15, Township 21 North, Range 6 East, and includes very limited areas of the northwest quarter of the northeast quarter of Section 22, Township 21 North, Range 6 East, all within the City limits of Black Diamond, Washington. The preliminary plat is situated on approximately 136 acres consisting of the following King County Tax Parcels: 152106-9108, 152106-9096 and 222106-9004.

BRIEF DESCRIPTION OF PROPOSED PROJECT

The Applicant proposes to subdivide 3 existing tax parcels (152106-9108, 152106-9096 and 222106-9004) subject to a Lot Line Adjustment submitted to the City concurrently with this preliminary plat application into 203 lots and 5 Future Development Tracts under the provisions of Title 17 of the Black Diamond Municipal Code as set forth in Exhibit E to The Villages MPD Development Agreement dated December 12, 2011 (KC Recording No. 20120130000655) as amended by the First Minor Amendment dated June 22, 2012 (KC Recording No. 20120906000762) and the Second Minor Amendment dated August 8, 2012 (KC Recording No. 20120906000763) ("The Villages MPD Development Agreement"). Twenty additional tracts are provided to allow for utility, access, parks and open space uses, and sensitive areas. Located within these three tax parcels are two Villages MPD Development Parcels (V28 and V29). The total preliminary plat, identified as The Villages MPD Phase 2 Plat C comprises approximately 136 acres.

The 203 lots will range from a minimum size of 3,150 square feet (sf) to a maximum size of 8,547 sf. The average lot size is 4,528 sf. The plat's 203 lots are comprised entirely of detached single family alley and front loaded lots. The front loaded lots are located adjacent to wetland buffers, where it is impractical to provide alley lots or in areas where topography makes it difficult to provide alley lots in a reasonable manner. This proposed preliminary plat application includes one phase (not including Future Development

tracts). Future Development tracts will undergo additional site planning and review under separate applications. Please see The Villages MPD Phase 2 Plat C Preliminary Plat Project Narrative dated 11/08/2013 for further information regarding the proposal associated with the project site.

STATEMENT OF QUALIFICATIONS TO COMPLETE THIS HABITAT ASSESSMENT

The following provides a brief overview of my experience and credentials to conduct this Wildlife Habitat Assessment. I am the Founder, Owner, and Principal Wetland and Wildlife Ecologist of *Wetlands & Wildlife, Inc.* I attended the University of Montana where I graduated cum laude with a degree in Wildlife Biology. As of 2014, I have 13 years of direct experience as a professional Biologist/Ecologist in western Washington and 17 years of overall experience completing natural resource assessments among many different ecosystems across the western United States. I have worked as a professional Biologist/Ecologist for federal, state, and county environmental agencies, as well as several private environmental consulting firms with specialties in wildlife habitat, wetlands, streams, rivers, and lakes. In my 17 years of experience, I have specialized in review of proposed land use and building development permit applications as they pertain to Critical Areas (wetlands, rivers, streams, lakes, and habitats of protected fish and wildlife species). I gained much of that experience while employed as a Senior Ecologist for King County DDES and a Regulatory Biologist for Snohomish County PDS.

I received certifications from the Washington Department of Fish and Wildlife for terrestrial wildlife habitat assessments and wildlife surveys of special status wildlife species in Washington. I have 17 years of direct experience conducting wildlife habitat assessments and surveys of special status wildlife species (protected per federal and state laws) in the western United States. I have been selected as the technical expert by local jurisdictions to provide 3rd-party reviews of the recently adopted (2010) FEMA Floodplain Habitat Assessments and applicable Critical Areas Regulations. Over the past 17 years, I have conducted over 1,300 different biological / ecological assessments on properties with many habitat types and zoning designations, from small, urban properties (0.25 acres) to large, rural properties (up to 2,000 acres in size).

METHODOLOGIES OF HABITAT ASSESSMENT

The purpose of this additional habitat assessment was to examine the proposed project site for habitat associated with the species listed in the comment letters provided to the City of Black Diamond by Ms. Erika Morgan and Ms. Kristen Bryant. Note that the purpose of this assessment was related to potential wildlife habitat and was not intended to represent a wildlife survey for particular species. *Wetlands & Wildlife, Inc.* conducted an additional site visit on September 17th, 2014 specifically related to the public comments provided by Ms. Morgan and Ms. Bryant.

In addition to the on-site assessments, *Wetlands & Wildlife, Inc.* also reviewed the online version of the Priority Habitat and Species (PHS) maps provided by the Washington Department of Fish and Wildlife (WDFW) and researched public information available on King County's iMAP system.

FISH AND WILDLIFE SPECIES MENTIONED IN PUBLIC COMMENT LETTER

During the public comment period associated with the aforementioned project, Erika Morgan requested that further assessments be completed related to some wildlife species that she opined may use the subject property or nearby vicinity as habitat. The list of the species that Ms. Morgan included in her public comments associated with this project is included below:

Northern spotted owl (*Strix occidentalis caurina*)
Fisher (*Martes pennanti*)
Canada lynx (*Lynx canadensis*)
Newt (exact species not identified by Ms. Morgan)
Cougar (*Puma concolor*)
Great blue heron (*Ardea herodias*)

The City also received public comments written by Ms. Kristen Bryant in an email on July 1, 2014. Ms. Bryant's only comment related to fish and / or wildlife habitat is that "the wildlife habitat review does not address a plan ensuring protection of" the steelhead (*Oncorhynchus mykiss*), a threatened fish species. Please see the section below for my response to this comment by Ms. Bryant.

RESULTS AND FINDINGS OF HABITAT ASSESSMENT

Wetlands & Wildlife, Inc. conducted additional research of the subject parcel for the habitat and habitat requirements of the species listed above mentioned in the public comments provided to the City of Black Diamond. Our findings are discussed in depth below.

Several of the species listed above have similar habitat requirements for their life history traits that rely on complex old-growth or late successional coniferous forests. Therefore, the forest stand on the subject property was assessed in order to determine the current forest conditions. The upland areas of the on-site forest are primarily comprised of even-aged monotypic Douglas fir (*Pseudotsuga menziesii*) trees with a simple understory primarily comprised of sword fern (*Polystichum munitum*). The diameter at breast height (dbh) is a common measurement used to assess the age of forest stands for whether they are suitable for species that require old-growth or late-successional stands for habitat. The average dbh of the trees located among the on-site forest is approximately 15 dbh, indicative of an immature forest in the Puget Sound region of western Washington.

Northern spotted owls typically breed in old-growth or late-successional coniferous forests, requiring stands that equal to or greater 20 dbh average stand and 7" platforms at 50' height . Northern spotted owls typically use areas where vast connected old-growth habitat exists, and they typically avoid residential areas with daily human use due to their aversion to human activity (noise, developments, etc.). Based on the WDFW Priority Habitat and Species maps, no Northern spotted owl breeding sites (nests) are located among the project area. The project area does include a spotted owl management buffer, as shown on the PHS maps produced by the WDFW. Based on our assessment, no habitat typically selected by spotted owls exists on the subject property and the on-site forest does not meet their typical habitat requirements.

Therefore, the proposed project is not projected to have any adverse effects on northern spotted owls or any known breeding areas associated with northern spotted owls.

Fishers typically require forests with a high degree of diversity such as multi-aged stands with a high percentage of canopy closure, abundant large woody debris, large snags, cavity trees, and understory vegetation. Structural characteristics of forests are most important for fisher foraging, resting, and denning. Fishers have been found to select habitats dominated by large trees which are greater than 18.5" dbh in size, snags with a dbh of greater than 20.5", and downed logs with a dbh greater than 18.5". Based on our habitat assessment, no fishers were observed, no evidence of use by fishers was observed, and the forest characteristics do not meet the preferred habitat requirements for fishers. In addition, the WDFW Priority Habitat and Species maps do not report use by fishers on the project site or project vicinity. Therefore, the proposed project is not expected to have any adverse effects on fishers or their habitats.

Canada lynx typically select habitats that are located greater than 4,000 feet in elevation above sea level. Canada lynx have a diet which is primarily (almost exclusively) comprised of snowshoe hares. Therefore, the presence of adequate numbers of snowshoe hares is the key characteristic of habitat for Canada lynx. They are primarily associated with subalpine and boreal forest types in the mountains of north-central and northeastern Washington. Per our assessment, the project site does not contain habitat requirements for Canada lynx or their primary prey base (snowshoe hares). In addition, the WDFW Priority Habitat and Species maps do not report use by lynx on the project site or project vicinity. Therefore, the proposed project is not expected to have any adverse effects on lynx or their habitats.

Ms. Morgan's comment letter did not provide details about which newt species she has observed in the City of Black Diamond. However, the rough-skinned newt (*Taricha granulosa*) is the only native newt within Washington State. Therefore, we assume that Ms. Morgan is referring to the rough-skinned newt in her public comment letter. The rough-skinned newt is not included on the federal or state endangered, threatened, or sensitive species lists. Therefore, the rough-skinned newt and associated habitats do not receive special protection, unless that habitat is concurrently protected pursuant to other regulations.

Cougars and great blue herons are not listed on the federal endangered or threatened species list. Similarly, cougars and great blue herons are not listed as having a status of endangered, threatened, or sensitive in Washington State.

As stated in Ms. Bryant's public comments, Puget Sound DPS steelhead trout are listed as a Threatened species. However, the project proposal does not include any impacts to Rock Creek or any open water associated with the wetland areas associated with Rock Creek. Further, Rock Creek and the associated wetland areas are regulated and protected as a Core Stream and Wetland Complex. Therefore, Rock Creek, wetland areas, and associated protective buffers will be protected in perpetuity and the project does not include any proposed impacts to the Core Stream and Wetland Complex or buffer areas. Based on this information, the proposed project will not create any adverse impacts on steelhead trout.

SUMMARY AND RECOMMENDATIONS RELATED TO THIS HABITAT ASSESSMENT

As mentioned in the previously submitted Wildlife Habitat Assessment Report, the subject property does provide habitat for a wide variety of wildlife species, primarily due to the overall size of the property, the landscape context, the interspersed habitat types, and presence of multiple habitat requirements (thermal cover, hiding cover, foraging opportunities, and water) in relatively close proximity.

As depicted on project maps, the project proposal includes the permanent protection of a 300-foot-wide wildlife corridor, along with the permanent protection of the wetlands and wetland buffers among the subject property. These areas are regulated as a Core Stream and Wetland Complex, pursuant to City code section 19.10.310.A. Another regulated subset of fish and wildlife conservation areas are listed in the City of Black Diamond Code section 19.10.310.B. This code section states "Areas outside of the Core Stream and Wetland Complex include areas within the City which state or federally designated endangered, threatened, and sensitive species have a known primary association...". *Wetlands & Wildlife, Inc.* found no indication of active breeding sites or evidence of breeding / nesting use by any federal or state special-status wildlife species within the subject property during our detailed wildlife habitat assessments and subsequent research efforts.

In conclusion, it is in the professional opinion of *Wetlands & Wildlife, Inc.* that the proposed project will not adversely impact any habitats of primary association for any wildlife species mentioned in the public comment letters provided to the City, or any other species listed on the federal or state endangered, threatened, or sensitive lists.

LIMITATIONS AND USE OF THIS REPORT

Please note that the purpose and focus of this report is to address the public comments provided to the City of Black Diamond by Ms. Erika Morgan and Ms. Kristen Bryant. The report and field work are intended as an assessment of the vegetative conditions and landscape context among the subject property which may provide habitat conditions for special-status wildlife species. As described in this report, no habitats of primary association for threatened or endangered wildlife species were located on the project site, and none are expected to be located on the project site. Therefore, a wildlife survey was not completed and this report and associated field work are not intended to represent a wildlife survey for any particular species or individuals of a species. Seasonal variation of wildlife use among this site is expected. Therefore, absence of a species or lack of a detection related to any species in any particular month should in and of itself not be construed to suggest that a given species doesn't utilize the on-site habitats during a different portion of the year.

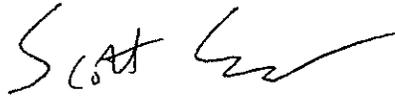
Wetlands & Wildlife, Inc. did not evaluate the site for the presence, extent, classification, or regulatory implications of any other Critical Areas types (e.g. wetlands, aquatic areas, or geologic hazard areas) which are also regulated by the City of Black Diamond Critical Areas Ordinance.

The work for this report has conformed to the standard of care employed by professional ecologists in the Puget Sound region. While *Wetlands & Wildlife, Inc.* upheld professional industry standards when

completing this review, the information included in this report does not guarantee approval by any federal, state, and/or local permitting agencies. Therefore, *Wetlands & Wildlife, Inc.* does not recommend commencing any activity which requires a permit on the property until all appropriate permits have been obtained.

If any questions arise regarding this review, please contact me directly at (425) 337-6450.

Wetlands & Wildlife, Inc.

A handwritten signature in black ink, appearing to read "Scott Spooner", with a stylized flourish extending to the right.

Scott Spooner
Owner / Principal Wetland & Wildlife Ecologist

REFERENCES AND LITERATURE REVIEWED

King County iMAP: Interactive Mapping Tool. Administered by the King County GIS Center. <http://www.kingcounty.gov/operations/gis/Maps/iMAP.aspx>.

Lewis, J. C, and D. W. Stinson. 1998. Washington State status report for the fisher. Wash. Dept. Fish and Wild;., Olympia. 64 pp.

Pierce, D.J., J.B. Buchanan, B.L. Cosentino, and S. Snyder. 2005. An assessment of Spotted Owl habitat on non-federal lands in Washington between 1996 and 2004. Final report. Washington Department of Fish and Wildlife, Olympia, Washington, USA 187 p.

Stinson, D. W. 2000. Draft Washington state recovery plan for lynx. Washington Department of Fish and Wildlife, Olympia, Washington. 86 pp. + 5 maps.

Washington State Department of Fish and Wildlife. Priority Habitats and Species map (PHS on the Web) for Section 15, Township 21 North, Range 6 East. <http://wdfw.wa.gov/mapping/phs/>.

Washington State Department of Fish and Wildlife. Species of Concern List. Priority Habitats and Species List. <http://wdfw.wa.gov/conservation/endangered/lists/search.php?searchby=AnimalType&search=Bird&orderby=CommonName>.

Attachment 4

**Golder Associates Memorandum Regarding Response to Public Comments on Preliminary
Plat 2C**



TECHNICAL MEMORANDUM

Date: December 4, 2014
To: Colin Lund, Chief Entitlement Officer
From: James G. Johnson, LG, LEG
cc: Al Fure, Triad Associates Inc.
RE: **RESPONSE TO PUBLIC COMMENTS ON PRELIMINARY PLAT 2C**

Project No.: 063-1076-001.405
Company: BD Villages LP

1.0 BACKGROUND

Golder Associates Inc. (Golder) has provided technical responses to review comments on documents submitted for the permitting of Plat 2C at the Villages in Black Diamond, Washington. This technical memorandum summarizes our comment responses.

Golder prepared a technical memorandum dated May 8, 2014 (copy attached) addressing comment #6 by Pertect Engineers (undated comment list). There were several follow-up comments and responses following Golder's May 2014 technical memorandum that were submitted and responded to by Golder via e-mail. These comments and responses have been included in the following sections of this technical memorandum.

2.0 COMMENTS AND RESPONSES FOLLOWING GOLDER'S MAY 2014 TECHNICAL MEMORANDUM

2.1 Comment #1 (by Gil Bortleson)

Golder's response is wholly inadequate. Golder based its review on Triad's drainage analysis which was not intended to determine wetland impacts. Golder acknowledges the inadequacy of Triad's drainage analysis and recommends that an additional drainage review should be conducted later to account for any "subtle" changes. However, such a later analysis would not be subject to SEPA or plat hearing review, and should certainly not be limited to "subtle" changes.

2.2 Golder Response to Comment #1

This comment misreads what we have stated, as we did not assert that Triad's drainage analysis is inadequate. As stated in the most recent version (2012) of the Ecology Stormwater Management Manual for Western Washington, "Ecology found it difficult to model water surface elevation changes, especially for riverine and slope wetlands, the new regulatory strategy is to simply try to match pre-project surface and ground water inputs that drive the water surface elevation in wetlands..." We reviewed Triad's drainage analysis and found that it maintains (matches) the average annual recharge volume to the

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Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

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wetlands from pre-developed to developed project conditions as suggested by the most recent regulatory strategy.

To clarify the last sentence, we recommended that during final engineering review of Phase 2 Plat C, an update to the preliminary drainage analysis (using the same methodology as Triad previously completed) be conducted to account for any design changes from the preliminary plat design to the final engineering construction drawings.

2.3 Comment #2 (by Gil Bortleson)

Golder acknowledges that the City does not use the best available science for doing hydroperiod analysis of wetlands, but offers no suggestion for how to address this deficiency.

2.4 Golder Response to Comment #2

We suggest the method that Triad presented is suitable for matching pre-developed to developed water inputs.

2.5 Comment #3 (by Gil Bortleson)

Golder's conclusion about "annual average recharge volume" ignores the issue of seasonal variations, changes in hydrologic regime cycles, changes during storm events and changes during the dry season.

2.6 Golder Response to Comment #3

Triad has proposed to discharge an equivalent annual volume of surface water through a long linear level spreader at the buffer of the wetland. Through the level spreader, wetland buffer and wetland, runoff will attenuate and simulate the seasonal variation of the hydrologic regime for both storm events and dry times.

3.0 COMMENTS ON GOLDER'S GEOTECHNICAL REPORT

3.1 Comment #1 (by Gil Bortleson)

The groundwater analysis was done during the driest time of the year, early September.

3.2 Golder Response to Comment #1

Groundwater conditions were described in the Geotechnical Report. The report did not include a more in-depth analysis because it was not needed for the type of construction proposed. The purpose of the description of groundwater conditions in the Geotechnical Report was to illustrate that shallow groundwater was not encountered in the test pits or monitoring wells installed on the site. The 2013 soil test pits excavations occurred in early September. However, there have been previous excavations within or adjacent to the site boundary and groundwater levels have been monitored in piezometers installed in several of those test pits. For example, a piezometer was completed in TP-117 in 2010.

Numerous water level measurements have been made in that test pit, including winter/spring measurements from 2011 through 2014. Groundwater levels at TP-117 have been at least 21 feet below ground surface (bgs) in each measurement.

3.3 Comment #2 (by Gil Bortleson)

The soil tests were shallow and didn't cover most of the site.

3.4 Golder Response to Comment #2

The test pits were generally excavated to 5 to 10 feet bgs to evaluate shallow sub-surface conditions. However, Test Pit TP-117 was completed to a depth of 20 feet bgs, TP-36 was completed to a depth of 18 feet bgs, and monitoring well MW-31 was completed to a depth of 36 feet bgs. The use of test pits to evaluate subsurface conditions was appropriate for the proposed developments. The test pits confirmed the presence of compact to dense native soils suitable for shallow spread footing foundations.

3.5 Comment #3 (by Gil Bortleson)

There is no basis offered for the selection of pit locations.

3.6 Golder Response to Comment #3

Test pit locations were distributed across the site to confirm local geology and provide geotechnical information for design.

Sincerely,

GOLDER ASSOCIATES INC.



Scott Stoneman, PE
Senior Water Resources Engineer



James G. Johnson, LG, LEG
Principal Engineering Geologist

Attachment: Golder Associates Inc. Technical Memorandum Dated May 8, 2014

SS/JGJ/cb

ATTACHMENT

Date: May 8, 2014
To: Colin Lund
From: Scott Stoneman, PE; James G. Johnson, LG, LEG
cc: Al Fure, Triad Associates Inc.
RE: **THE VILLAGES - RESPONSE TO COMMENT REGARDING WETLAND HYDROPERIOD ANALYSIS**

Project No.: 063-1076-001.212
Company: BD Villages LP
Email: sstoneman@golder.com

This technical memorandum addresses Comment #6 of the Phase II Plat C Preliminary Plat Review regarding the wetland hydrologic analysis prepared by Triad Associates Inc. (Triad).

1.0 COMMENT #6

Hydrologic regimes play a major role in the biotic composition, structure, and function of wetland ecosystems. Pursuant to Section 7.4.3(B) and (G) of The Villages MPD Development Agreement (DA), post-construction hydrologic support of wetlands is required because wetlands could be adversely affected by hydrologic alteration caused by development. The preliminary drainage analysis prepared by Triad Associates has modeled the water budget in each subbasin in order to design roof drain infiltration trenches which will contribute water to wetland areas post-construction. We recommend that this approach be reviewed by the MDRT hydrogeologist to verify that no impact to wetland hydrology has been demonstrated and is consistent with wetland protection provisions relating to wetland hydroperiods described in the 2005 Ecology Stormwater Manual for Western Washington.

2.0 RESPONSE TO COMMENT #6

The City of Black Diamond adopted the 2005 Edition of the Department of Ecology's Stormwater Management Manual for Western Washington (SWMMWW), with the exception of Volume 1, which was replaced by Appendix 1 of the Western Washington Phase II Municipal Stormwater Permit (Phase II Permit), titled "Minimum Technical Requirements for New Development and Redevelopment."

The hydroperiod analysis methodology as referenced in Comment #6 was intentionally omitted from the Phase II Permit supplemental guideline adopted by the City of Black Diamond. Regardless, Golder Associates Inc. (Golder) conducted a review of the hydrologic methodology used by Triad in their Preliminary Drainage Analysis and found it to maintain the average annual recharge volume to the wetlands from pre-developed to developed project conditions. It is our opinion that the methodology used by Triad maintains the hydrologic conditions of discharges to the wetlands and meets the requirements of the 2005 Ecology Stormwater Manual for Western Washington as adopted by the City of Black Diamond



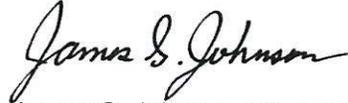
and amended by the Phase II Permit. Therefore, we believe no substantial impact to wetland hydrology is demonstrated by Triad's preliminary drainage analysis.

We do recommend that during final engineering review of Phase 2 Plat C, an update to the preliminary drainage analysis be conducted by Triad to account for any subtle design changes from the preliminary plat design to the final engineering construction drawings.

GOLDER ASSOCIATES INC.



Scott Stoneman, PE
Senior Water Resources Engineer



James G. Johnson, LG, LEG
Principal

SS/JGJ/cb

Attachment 5

**Triad Associates Memorandum Regarding The Villages – Preliminary Plat 2C Public
Comments**



MEMORANDUM

Date: December 8, 2014
To: Colin Lund, YarrowBay Holdings
From: Al Fure, PE
RE: The Villages – Preliminary Plat 2C Public Comments
Triad Job No.: 10-001

Triad has reviewed the public comments and provides the following answers:

- 1) The report's average annual runoff tables are inconsistent with best available science. The runoff estimates for till forests, for example, are grossly overstated. This, in turn, minimizes the impact of clearing and grading those forests on wetlands and downstream drainage features.***

The above comment does not identify its source of information. Therefore, it is difficult to address the specific concern. However, to attempt to address the intent of the comment we will clarify the source of the information on average annual runoff volume provided in the Phase 2 Plat C drainage report.

The average annual runoff tables provided in *The Villages MPD Preliminary Plat Phase 2 Plat C Preliminary Drainage Analysis* are based on the *Environmental Impact Statement Technical Report on Geology, Soils and Ground Water* prepared by Associated Earth Sciences, Inc. (FEIS AESI Report) from Appendix D of *The Villages Master Planned Development Final Environmental Impact Statement*. The runoff table within the sensitive areas report was created by scaling the tables within Appendix 10 of the FEIS AESI Report to a unit of one acre for each groundcover. Section 5 of the FEIS AESI Report discusses the Pre-Developed Condition Water Balance; with section 5.6.4 – Runoff, providing the following description for the basis of the runoff component:

“For the purposes of our analysis, we have included interflow in our runoff term. Interflow commonly accumulates seasonally in areas underlain by lodgment till. It consists of surface water that percolates down through the relatively permeable, surficial weathered till soils and becomes perched on underlying, low-permeability, unweathered till surface. Ground water flow direction in the interflow zone is largely controlled by the topography of the underlying, unweathered till surface, which usually corresponds to surface topography.”

As interflow is a major contributor to the onsite wetlands, the interflow has been included as a portion of the runoff/stormwater to be matched in the developed condition to maintain wetland hydrology. The above comment may have been based on other types of runoff calculations which do not include interflow. The volumes could therefore be misinterpreted to be larger than appropriate when in fact they are needed in order to maintain the health of the wetland.

- (2) Condition of approval number 60 states that stormwater designs "shall include low impact development techniques wherever practical and feasible" but the plat conditions include no provisions to accomplish this. Techniques such as permeable pavement on road and walkways have not been considered even though these have been found to be both "practical and feasible".**

Low Impact Development (LID) techniques are being employed at the north end of Phase 2 Plat C in an area of outwash soils which provide opportunity for infiltration (see bioretention cells on Sheet RS1). Dispersion is recognized as an LID technique and is being utilized for wetland recharge. The majority of the site is underlain by glacial till which does not afford feasible approaches to LID. In summary, LID techniques are being provided to the extent practical and feasible.

- (3) No consideration has been given to the reduction of runoff from individual lot landscaping.**

Reduction of runoff from lot landscaping is not a condition in either the MPD or Development Agreement. In addition, the treatment of lot landscaping is dealt with during the construction plan phase when those details are specified. It is likely that re-use of topsoil stripping within the site will result in a greater depth of topsoil than in the existing condition. This will help reduce runoff from lot landscaping by providing a zone for the absorption of runoff. Again, this will be dealt with in detail when applying the City drainage code to the preparation of the final construction plans.

- (4) Condition 76 specifically requires updated phosphorus control methods "even if the Applicant's ponds and facilities would otherwise be vested to a lower standard". The Plat does not meet this requirement and there is no evidence in the record that the Applicant's or City's consultants were informed about this condition or were directed to identify and apply such additional methods.**

Phase 2 Plat C incorporates an innovative approach to phosphorous control methods that was not anticipated at the time of the MPD and DA approvals. Previously, roadway drainage (a known contributor to phosphorous runoff) was planned to be collected and treated in a large wet pond and then dispersed to the wetland that lies east of the site and whose ultimate discharge leads to Lake Sawyer. An alternative concept was derived where the roadway runoff is taken to a location for treatment and infiltration OUTSIDE the Lake Sawyer basin while rooftop runoff (defined as clean runoff in the city drainage standards subject to restrictions on roofing material) is collected and dispersed to provide wetland recharge. Therefore, the application has met the intent of Condition 76 by developing a means by which the potential for phosphorous entering the Lake Sawyer basin has been greatly reduced.

- (5) Condition 101 requires fire access roads to comply with the International Fire Code. The Plat configuration for road access does not comply with this requirement.**

The comment is unclear with respect to how the plat does not comply with International Fire Code (IFC) requirements for access. IFC code is a common design parameter in which plats throughout the region are designed to meet. The following summarizes how Phase 2 Plat C meets IFC requirements for Fire Apparatus Access Roads:

Section 503.2.1 of the IFC requires an unobstructed width of not less than 20 feet and an unobstructed vertical clearance of not less than 13 feet 6 inches, both of these requirements have been satisfied with the proposed configuration.

Section 503.2.3 of the IFC requires surface to support fire apparatus and provide all weather driving capabilities. The road surfacing proposed will provide all weather driving and final engineering design of the road section will confirm support of imposed loads from fire apparatus.

Section 503.2.4 of the IFC states “The required turning radius of a fire apparatus access road shall be determined by the fire code official.”

The minimum turning radius provided are based on experience with similar sites. These plans have been provided to the fire code official for review and comments. Slight changes to radiuses can be incorporated into final engineering design plans as required by the fire code official.

Section 503.2.5 of the IFC requires that dead-end fire apparatus access roads in excess of 150 feet in length shall be provided with an approved area for turning around fire apparatus. There are technically NO dead end fire apparatus roads within Phase 2 Plat C since an emergency vehicle only access has been provided at the terminus of Wooner A. In addition, a turn around has been provided on the west segment of this roadway to provide additional access options.

In summary, Phase 2 Plat C meets all applicable International Fire Code requirements for fire access roads.

(6) The internal road circulation system is not well documented and is not fully consistent with traffic design standards.

The comment is unclear with respect to what aspect of the internal road circulation system is not consistent with traffic design standards. The following summarizes how the Phase 2 Plat C road system meets applicable standards:

The road system is well documented in the Phase 2 Plat C plans. The road sections are all detailed with dimensions shown. The alignments are shown to scale with road centerline radius' defined.

Proposed Roads A, B and C are designed in accordance with Chapter 6 of The Villages MPD Development Agreement.

A deviation request has been prepared and submitted for the road section proposed to be used on Woonerfs A, B and C. The Designated Official may approve alternative road sections as discussed in Section 6.3 of The Villages MPD Development Agreement. A copy of the approved deviation request to allow the road section proposed for the woonerfs can be found in Exhibit 17A of the Staff Report.

In summary, the Phase 2 Plat C road network has been designed to applicable standards and an approved deviation to the code based on it meeting all the deviation criteria.

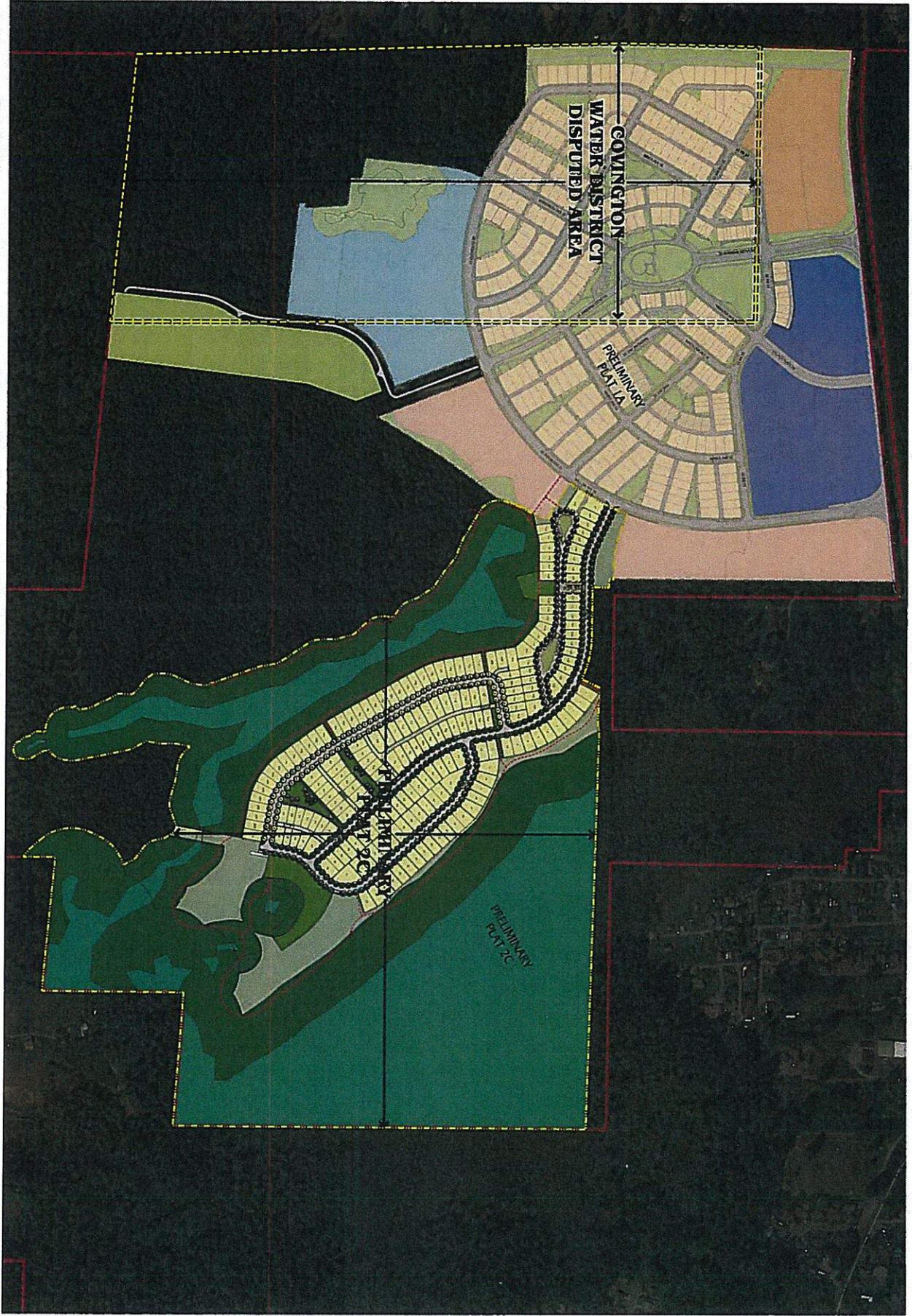
(7) In an apparent attempt to comply with the 150-unit limit for a single point of access, a substandard second access is proposed that does not meet traffic design standards.

Phase 2 Plat C exceeds the requirements relative to unit count relationship to secondary access. Section 3.2.02.D of 2009 City of Black Diamond Engineering Design and Construction Standards states “A single point of access shall serve no more than 150 units, except on an interim basis up to 300 units where a future point of access will be extended”. Since Phase 2 Plat C has less than 300 units, and the MPD clearly shows the intent for a future point of access, it meets this requirement without providing a second point of access. However, Phase 2 Plat C has provided a secondary access for emergency vehicle access to ensure protection of the public interest for alternate access.

If you should have any questions or comments regarding any of the information provided here, please feel free to contact me.

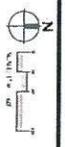
Attachment 6

Covington Water District Disputed Area Exhibit



The Villages - Preliminary Plat 2C

Y YARROWBAY HOLDINGS



Attachment 7

Transpo Group Memorandum Regarding The Villages MPD – Phase 2 Plat C, Response to Public Comments

MEMORANDUM

Date: December 5, 2014 **TG:** 05387.03

To: Colin Lund and Megan Nelson – YarrowBay Holdings

From: Kevin L. Jones, P.E., PTOE – Transpo Group

Subject: The Villages MPD - Phase 2 Plat C, Response to Public Comments

This memo provides responses to the transportation-related comments described in Ms. Judith Carrier's comment letter dated July 1, 2014. Each comment is reiterated in italics below followed by a written response.

Comment No. 2 (MPD Conditions of Approval that are not properly applied to the Plat 2C):
"Condition of approval number 21 requires the development of a street grid system, but the plat utilizes a single access system and other design approaches that are inconsistent with a grid system."

The condition Ms. Carrier references states, "Implementing projects shall be designed to foster the development of a street grid system throughout the project." The street system within Plat C is designed in a grid pattern and satisfies this condition. For example, "Road A" parallels the majority of "Road B" and "Road C" with connections between these roadways located in the central and southern portions of the plat. Other design elements promoting an overall grid system include the absence of cul-de-sacs and stubbing "Road B" to allow for future connectivity to the areas south.

Comment No. 3 (MPD Conditions of Approval that are not properly applied to the Plat 2C):
"Condition of approval number 30 requires measures to reduce speeds on neighborhood streets. The measures employed are not adequate to achieve this result. There are long straightaways and no mention of measures such as speed bumps or roundabouts that would slow traffic. Instead, the straight roads look like racetracks for people pulling out of small alleys late to work."

The condition Ms. Carrier references states, "The applicant shall apply road design speed control and traffic calming measures so that inappropriate speeds are avoided on neighborhood streets." The Traffic Impact Study prepared for the subject project dated December 19, 2013 addresses in detail the numerous ways in which this condition is satisfied.

The plat is designed with narrow, 10-foot wide travel lanes coupled with several curb-bulb outs and on-street parking on both sides of the street. In fact, "Road A" includes 10 curb-bulb outs (spaced 280 feet apart, on average), "Road B" includes four curb-bulb outs (spaced 500 feet apart, on average), and "Road C" includes eight curb-bulb outs (spaced 250 feet apart, on average). Curb-bulb outs narrows the roadway width requiring motorists to travel at slower speeds and on-street parking has a measurable effect on reducing vehicular speeds as well. Curb-bulb outs combined with the provision for on-street parking collectively prevent long, wide straightaways and consequently, limit excessive speeding within the plat.

Comment No. 1 (Subdivision Code Requirements that are not properly applied): "The internal road circulation system is not well-documented and is not fully consistent with traffic design standards."

Ms. Carrier's comment is generalized and she does not provide specific support for her claim. The design of the road system within Plat C follows Section 6 ("Internal Street Standards Within The Villages MPD") of The Villages MPD Development Agreement (DA) or the *City of Black Diamond Engineering Design and Construction Standards* in cases in which an applicable standard is not defined in this section of the DA.

Comment No. 2 (Subdivision Code Requirements that are not properly applied): "In an apparent attempt to comply with the 150-unit limit for a single point of access, a substandard second access is proposed that does not meet traffic design standards."

Section 3.2.02(D) of the *City of Black Diamond Engineering Design and Construction Standards* states, "A single point of access shall serve no more than 150 units, except on an interim basis up to 300 units where a future point of access will be extended." This provision is reiterated in Condition No. 27 of The Villages MPD Conditions of Approval. This section of the *Standards*, as well as this condition, is satisfied as (1) Willow Avenue SE will provide primary vehicular access via "Road A" and secondary access via "Woonerf A," (2) the plat includes 203 residential units, well below the 300-unit limit, and (3) "Road B" will be extended in the future with development south of the plat. In the event "Road A" is blocked east of Willow Avenue SE, emergency vehicles could access the plat via "Woonerf A." "Woonerf A" is the same width (20 feet) as the two travel lanes of "Road A" combined.

Attachment 8

**Golder Associates Memorandum Regarding Response to E-Mail Complaint of Silt in
Water Well By Ms. Erika Morgan**

A bentonite and cement surface seal was installed to a depth of 19 feet bgs. The well is constructed with a stainless steel well screen with 0.018-inch openings from 125 to 130 feet bgs. The depth to water was 50 feet bgs at the time of well completion (August 1981). Information on the well log indicates the well was tested using a bailer at a rate of 10 gallons per minute (gpm) for 1 hour. After the 1-hour bail test, the drawdown was 31 feet (i.e. a depth to water of 81 feet bgs). The capacity of the pump installed in the well is not known.

Additional depth to water information for the Morgan Well was obtained from King County's groundwater program³. The depth to water was 37.48 feet below the measuring point on June 11, 1986, and 38.12 feet below the measuring point on April 9, 1987. A third measurement of 32.36 feet below the measuring point on September 8, 1986 was provided by Erika Morgan. This is equivalent to a groundwater elevation of about 603 to 590 feet above mean sea level (amsl) based on a reported surface elevation of 640 feet. The current depth to water is uncertain.

1.1 Hydrogeologic Conditions

The Morgan Well is located about 1,000 to 1,200 feet north of a test well (MW-14) completed by AESI (2008). MW-14 is completed in pre-Olympia age glacially-deposited sand and gravel (termed Qpog_{2c} by AESI). The groundwater elevation in MW-14 fluctuates about 4 to 7 feet per year (from elevation 557 to 564 feet msl; Attachment C) based on data collected between November 2006 and July 2013. Groundwater levels in MW-14 increase between about mid-November and mid-December in response to seasonal recharge, reaching a maximum in mid to late April before declining. The lowest seasonal groundwater elevations are observed in late fall, immediately prior to the start of seasonal increases. Based on the log of MW-14 and AESI geological cross section B-B' (included in Attachment C) and information from the Morgan Well it appears the Morgan Well was completed in the same pre-Olympia sand and gravel materials.

The groundwater elevations in the Morgan Well and MW-14 are higher than the groundwater elevation in wells completed in younger Pre-Olympia age glacially deposited sand and gravel underlying the Villages site to the west (termed Qpog_{1c} by AESI), which range from about 480 to 510 feet msl (see AESI figure in Attachment C). Groundwater is inferred to flow south and west towards the Green River based on groundwater flow direction in the Qpog_{1c} materials.

2.0 EVALUATION OF MORGAN WELL AND RELATIONSHIP TO CLEARING AND GRADING AT THE VILLAGES

Trees were cleared at the Villages site in June and July 2014; grading of the site continued through September 2014. Silt was reported to be present in the Morgan Well from September 26 through October

³ King County Water and Land Services. Groundwater Well Data. Online at: http://green.kingcounty.gov/groundwater/well-detail.aspx?well_id=6739. Accessed on December 8, 2014.

18, 2014. The silt content was not quantified (i.e. as turbidity or total suspended solids measurements). The depth to water and pumping history at the time of the reported silt in the well is not known.

The former gravel borrow pit in Phase 1A of the Villages was excavated in recessional outwash deposits to the top of the till, and was not excavated into the older pre-Olympia age glacial deposits underlying the till. Seasonal water has been observed in the former gravel borrow pit. Groundwater level measurements in nearby wells completed in the recessional outwash (above the till) suggest the outwash is generally dry except occasionally during wet months, or in areas where the till formed a subsurface low. The water observed in the former gravel pit is perched water on the low-permeability till rather than an expression of the water table in the underlying pre-Olympia deposits.

Water Year 2014 and average water year precipitation at King County Gage BDIA is included in Attachment C. Water Year Precipitation between June and September 2014 was about 9.5 inches; average water year precipitation over the same time period is about 8.5 inches. Therefore, precipitation was slightly above average between June and September. Water Year 2014 precipitation was about 52.6 inches, similar to the average water year precipitation of 50.3 inches (over Water Years 2001 through 2014).

It is our opinion that the reported silt in the Morgan Well is not attributable to the clearing and grading activities in Phase 1A of the Villages due to the following facts:

- The clearing and regrading work was completed during the dry season. Based on historical groundwater elevation monitoring in MW-14 and other wells completed in the pre-Olympia glacial materials at the Villages site, groundwater levels in the pre-Olympia glacial materials were declining when the clearing and grading was completed. This indicates that little or no groundwater recharge was occurring when the site was cleared and re-graded.
- Groundwater flow in the pre-Olympia glacial aquifers is to the south and west towards the Green River based on historical groundwater elevation measurements. Groundwater elevations in the Morgan Well and MW-14 are at least 60 feet higher than the groundwater elevation in wells completed in the pre-Olympia glacial aquifers west of the Morgan Well in Phase 1A of the Villages. Therefore, the Morgan Well appears to be upgradient of the activity at the Villages site.
- Precipitation will infiltrate through surficial soils to the underlying materials where they are permeable (recessional outwash), or run off in areas where they are low-permeability (till). In the area of the Morgan Well, shallow groundwater flow is either towards Black Diamond Lake or north towards Rock Creek based on information presented by AESI (Attachment C). In the Phase 1A area of the Villages, shallow groundwater flow is complex because of the undulating surface of the till underlying the recessional outwash. In the area of the former gravel borrow pit, shallow groundwater flow is to the south towards a "window" where the till has been eroded and the recessional outwash is in contact with the underlying pre-Olympia glacial aquifers. Groundwater flow in the pre-Olympia glacial aquifers in the vicinity of Phase 1A is to the southwest based on groundwater elevation measurements.
- Phase 1A of the Villages is not in the Rock Creek drainage. There has been no discharge of surface water from the Villages site to the Rock Creek drainage during the

clearing and grading, and none are planned for the developed site. The reported rise in Rock Creek is likely attributable to documented beaver activity resulting in ponding of water behind dams and an increase in creek levels.

GOLDER ASSOCIATES INC.



Michael P. Klisch, LHG
Senior Project Hydrogeologist



James G. Johnson, LG, LEG
Principal

MPK/JGJ/tp

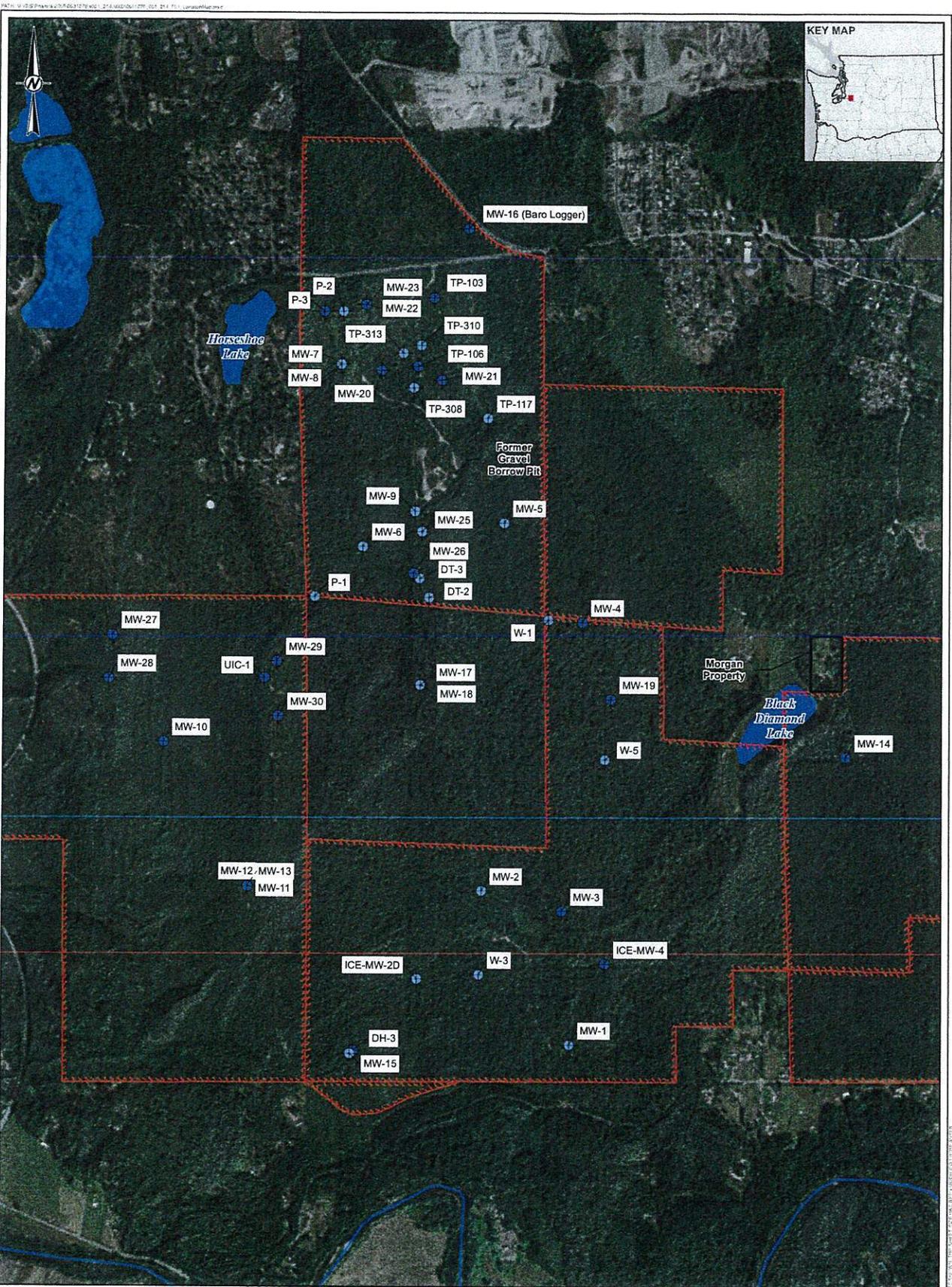
List of Figures

Figure 1 Location Map

List of Attachments

Attachment A Email Correspondence
Attachment B Morgan Well Log
Attachment C Hydrogeologic Information

FIGURES



LEGEND

Monitoring Well

- Instrumented with Pressure Transducer
- No Pressure Transducer
- River
- Parcel/Property Boundary
- Lake

REFERENCE(S)

1. ESRI: 2014 WORLD IMAGERY
2. KING COUNTY: LIDAR HILLSHADE
3. COORDINATE SYSTEM: NAD 1983 STATEPLANE WASHINGTON NORTH FIPS 4601 FEET DATUM: NORTH AMERICAN 1983



CLIENT
BLACK DIAMOND PROPERTIES, L.P.

PROJECT
BDVILLAGES/THE VILLAGES PROJECT/WA

TITLE
LOCATION MAP

CONSULTANT



YYYY-MM-DD	2014-12-09
DESIGNED	-
PREPARED	TH
REVIEWED	MK
APPROVED	MK

PROJECT NO
0631076.001

CONTROL
214

FIGURE
1

**ATTACHMENT A
EMAIL CORRESPONDENCE**

Justin Wortman

From: Colin Lund
Sent: Thursday, December 04, 2014 1:25 PM
To: Megan Nelson; Justin Wortman
Subject: FW: ground water quality south king county
Attachments: doc06320020141130124156.pdf

-----Original Message-----

From: Erika Morgan [mailto:erikamorganblackdiamond@gmail.com]
Sent: Thursday, December 4, 2014 1:03 PM
To: lanes@goodfellowbros.com; Greg.Rabourn@kingcounty.gov; jnol461@ecy.wa.gov Nolan; lmor461@ecy.wa.gov; cthorn@auburnwa.gov; william.appleton@cityoffederalway.com; sbauer@kentwa.gov; customerservice@highlinewater.org; customerservice@wd111.com; bob.taylor@covingtonwater.com; Colin Lund - Yarrow Bay Holdings
Cc: Erika Morgan; Brenda Martinez; carol_a_morris@msn.com; Erika Morgan
Subject: ground water quality south king county

Hello;

I am Erika Morgan, for full disclosure, I am on the Black Diamond City Council, but this concern is as a private individual, as a property owner and private domestic water well user.

1. My well water had white glacial silt in it Friday September 26, 2014 , a condition that it had not experienced since its first drilling 35 years ago. The water was completely cleared up by October 18, 2014 when the grading and re-contouring of the "big gravel pit" on the Yarrow Bay PP1A property was completed. I will also include the public well reports on my well for your convenience below.
2. Ground under PP1A is described as supper permeable to any water infiltration, and as a principle aquifer recharge area, according to the Gould 5study of 1986. This study also indicates that the aquifer my well connects to, also connects to an incursion into groundwater represented by the "big old gravel pit" located on the PP1A property.
3. Late last fall (2013) the forest that has been growing on PP1A since 1986, has been completely removed and the ground of 100 acres scraped clean, completely removing any filtrating sponge or transpiration activity, that was protecting our shared aquifer. In a way the environment has never experienced in the past. In the past, logging and replanting of the forest occurred and that only during the low rainfall periods, and on a rotating schedule of no more then 40 acres at any one appropriate season.
4. Extensive re-conturing was done on the "large gravel pit" in PP1A, including moving it somewhat and changing its shape, this area has been mined for gravel in the past. It is an excavation into ground water that is below the water table except for late in particularly dry summers in its parent condition.
5. Gould's 5study indicates that the aquifer the Morgan well is connected to, could connect to the large gravel pit in PP1A, and the influx of white glacial silt, during the time of re-contouring of this site proves the connection.
6. Other wells in the area also complained of white glacial silt.
7. This area now is actually functioning as a huge 100 ac. "rain garden" sans the proper or indeed any rain garden lining or filling. The hydro seeding has made it attractive to hundreds of geese as a favored grazing and pooping area.
8. Since the clearing of PP1A last November, December the water level of our meandering Rock Creek wetland, site of the discharge of Black Diamond's failed sewage lagoons has come up 2 feet between Jones Lake and Lake Sawyer, because at least some water is running off PP1A and into this wetland probably under the surface through the gravelly supper permeable soil of PP1A.

9. Black Diamond's failed sewage lagoon treatment system caused the pollution of Lake Sawyer in the early 1980s, I fear the large hydro-seeded area attractive to many geese will only repeat the experiment of the failed sewage lagoons for Lake Sawyer.

9. Yarrow Bay has asked the city of Black Diamond to move ahead on their VILLAGES MPD PHASE 2 PRELIMINARY PLAT C - PLN13-0027-, which is an additional 103 acres just south of PP1A, and which will have the effect of increasing the effects of the previous clearing and grading. No applications have been made to actually proceed with any further development upon the cleared land, but there is some discussion about installing public utilities on it. 10.

Other aquifer users have also experienced the white glacial silt as I have and my concern is that the water connectivity the silt represents, means that our wells could also become contaminated like Lake Sawyer was in the past if organic pollutants spill from the cleared land into our shared aquifer.

The "Regional Water Association of South King County" had rejected the thought of Black Diamond re-injecting treated sewage water from a conventional plant into our shared ground water as being a part of the "fix" for Black Diamond's sewage issues because of fears for their shared groundwater aquifer being tainted. They wrote a letter in 1988 to such effect, a copy of which I will include. This together with the description of the super permeability of the ground under "The Villages in Black Diamond" has left me mystified as to why there are not measures and mitigations to protect your groundwater which is often on the surface in Black Diamond. Today, many more depend upon the water quality than did when the letter was written in May 1988.

It was precisely because of these findings that Black Diamond wrote into its Comprehensive Plan the requirement that a MPD would be required to proceed with development in its UGA reserve area that we are now discussing. Black Diamond further wrote into its Comp Plan that this area would be developed under the guidelines presented in "Rural by Design" because our citizens had experienced the local hydrology and realized any development would need to nestle into the parent contours of the land with large untouched native land between clustered small pockets of development so the regional hydrology could continue to work unmolested and protect the recharge area of the main human needs to our west. We have had a lot of speculation and dreaming in Black Diamond, that our legal team advised repeatedly was from 30,000 feet; but now we are to a place where the facts of the effects are beginning to manifest in reality, and it is certainly time for reality to bring the projects back to where we live, on ground level, and under the surface where our shared water table exists.

I am sorry to be so slow in making this report but am having a tough time finding an active successor of RWA who protects the shared groundwater in South King County. The promised "Water Management Plan" is available on line and I have read it, but sadly it too is peppered with cautions that there may be better science today, though much of the basic descriptions seem to substantiate what I have observed personally so they must still be perfectly valid.

How do I find some entity who will protect the public interest?

Black Diamond is supposed to be having a public hearing about Plat C on December 11, 2014 at 5pm in the Black Diamond Community Center.

Erika Morgan
33625 Abrams Ave. Black Diamond, 98010

My public well report data:

ERICA MORGAN - { View PDF }

Public Land Survey: NW, NW, S-23, T-21-N, R-06-E, Tax Parcel Number: (blank)

County: King, Well Address: (blank)

Well Log ID: 91163, Well Tag ID:(blank), Notice of Intent Number: (blank) Well Diameter: 6 in. , Well Depth: 130 ft.

Well Type: Water

Well Completion Date: 08/18/1981, Well Log Received Date: (blank)

Well ID

Well id S_4717S7122004601
 Location Name
 Name MORGAN ERICA
 Well Type
 well type Well
 Well Depth (ft)
 well depth 130
 Surface Elevation (ft)
 elevation ft. 640
 X Coord (WAN-SPF)
 x coord (wanspf) 13477S8.37S
 Y Coord (WAN-SPF)
 y coord (wanspf) 111372
 Has Water Level Data?
 water level data Yes = 37 feet june 10, 1986
 Has Water Quality Data?
 water quality data No
 Local Number
 local number 21N/06E-23D01
 Ecology Well Tag
 DOE well tag Unknown
 Parcel Number
 GWMA code South King County
 Basin
 basin Covington Creek
 CARA Area
 cara area None
 City
 city King County
 Well ID
 Measurement Date
 Measurement Time
 Water Level Depth (ft)
 Well Depth (ft)
 Measure Method
 S_4717S7122004601
 04/09/1987
 10:50
 water level 38.12
 well depth 130 by Steel tape

 S_4717S7122004601
 06/11/1986
 07:10
 water level 37.48 by Steel tape
 well depth 130

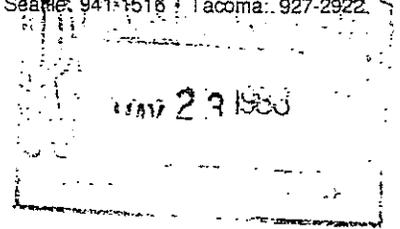
 S_4717S7122004601
 09/08/1986
 water level 32.36 by Steel tape
 well depth 130

Concern letter spoken of above:

RWA REGIONAL WATER ASSOCIATION OF SOUTH KING COUNTY

P.O. Box 4249 • 31627 - 1st Avenue South • Federal Way, Washington 98063
Seattle: 941-1518 • Tacoma: 927-2922

May 20, 1988



Brown & Caldwell
Consulting Engineers
100 West Harrison Street
Seattle, WA 98119

Attn: Mr. George Mason

Re: Black Diamond Waste Treatment

Gentlemen:

The Regional Water Association of South King County ("RWA") wishes to express its concern over the possibility of land application of Black Diamond's waste water.

RWA in coordination with DSHS, DOE and King County is in the process of preparing a Master Comprehensive Plan of Water Supply and Management for South King County - including the Black Diamond area. This study consists of three components: (1) A Critical Water Supply Plan under the State Act; (2) A Groundwater Management Plan under the State Act; and (3) A joint study with USGS of available groundwater resources.

One of the major thrusts of the above is aquifer management and protection.

Because of soil conditions and a pattern of shallow aquifers running from the Black Diamond area westward, land application of sewage could present a serious threat to groundwater critical to the future needs of South King County.

Very truly yours,

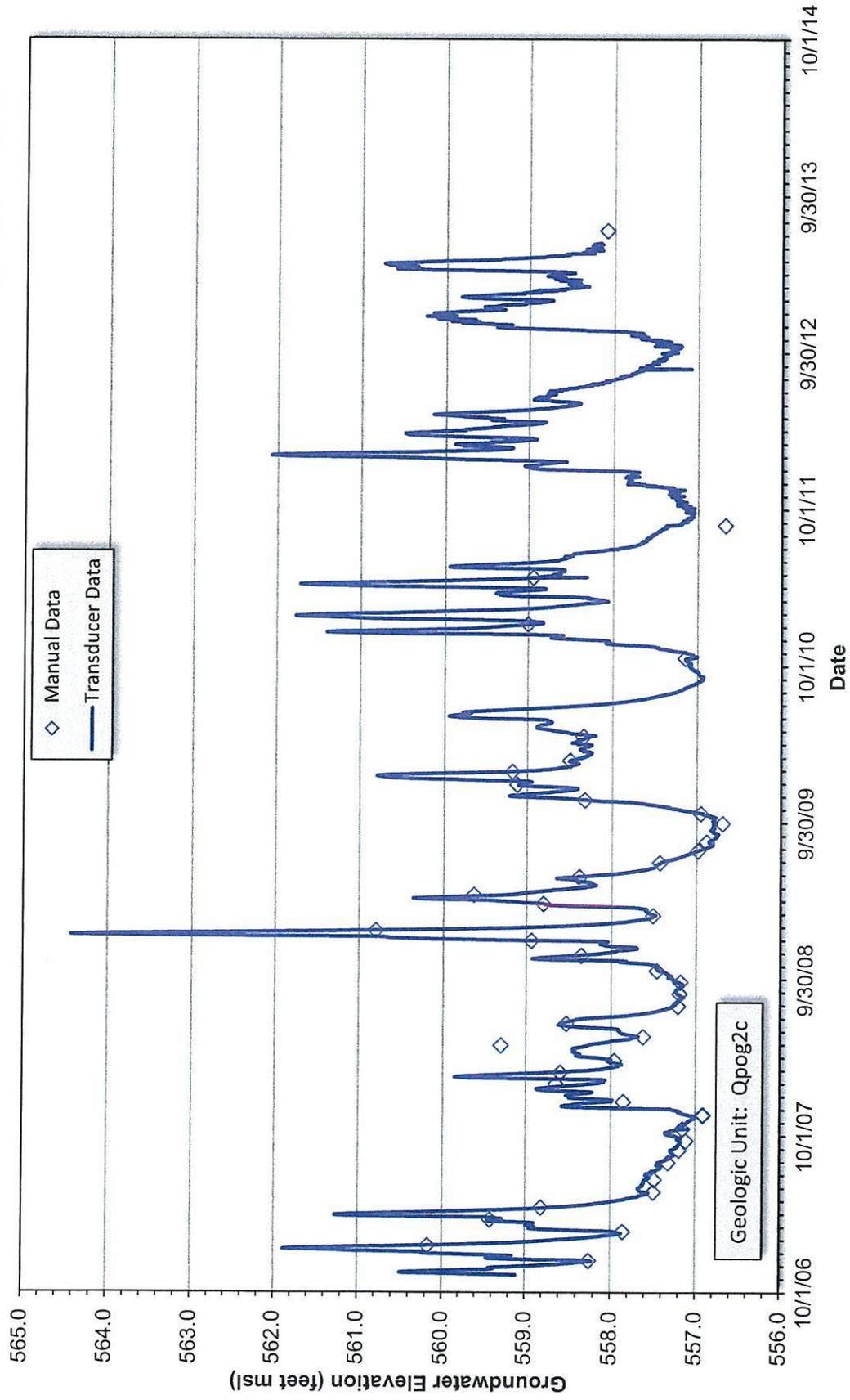
A handwritten signature in black ink, appearing to read "John T. Sawyer".

John T. Sawyer,
RWA Administrator

JTS/bjh

**ATTACHMENT B
MORGAN WELL LOG**

**ATTACHMENT C
HYDROGEOLOGIC INFORMATION**

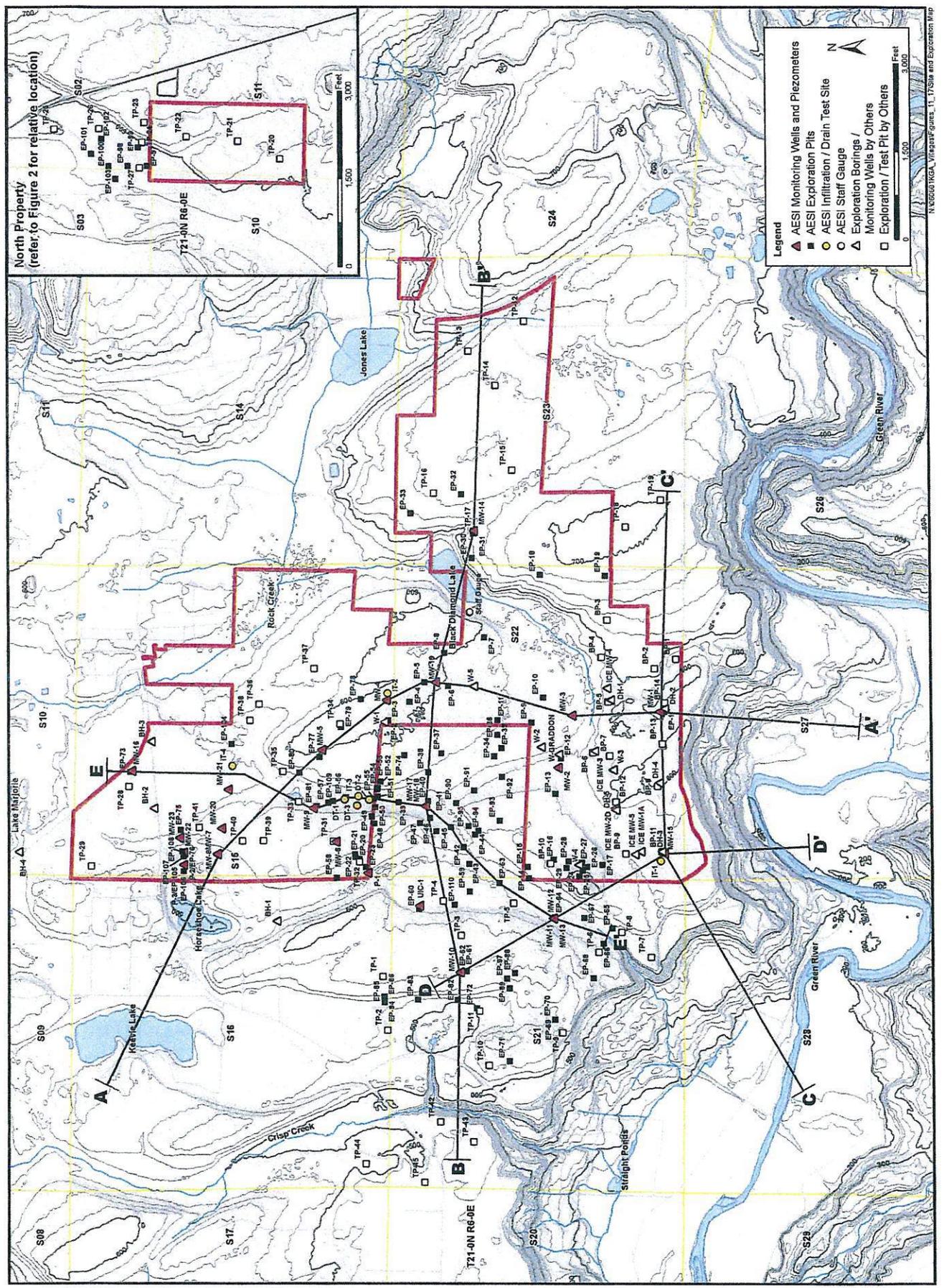


	Title		MW-14 (all data)		Drawn	BT
	Project Name		Villages Groundwater Monitoring		Checked	MPK
	Client Name		BD Villages LLP		Reviewed	JGI
			Project No.	063-1076-001.402	FIGURE C-1	
			Date	December 9, 2014		

SITE AND EXPLORATION MAP
THE VILLAGES
BLACK DIAMOND, WASHINGTON



Reference: Parcel outlines, roads, wetlands, water bodies - King County GIS center; Acquired 2-06.
Shaded relief (estimated sun) is assumed to have azimuth and altitude angles of 315 and 45 degrees, respectively, and contours were derived from 1 m DEM - King County GIS center; Acquired 2-06.



N:\06090901A_Village\figures_1_1\070816 and Exploration Map

LEGEND:

- RECENTHOLOCENE**
 - Qal RIVER ALLUVIUM
 - Qp PEAT/ORGANIC DEPOSITS
 - Qmw MASS WASTING
- VASHON**
 - Qvr RECESSIONAL OUTWASH
 - Qvic ICE-CONTACT
 - Qvt LODGEMENT TILL
 - Qva ADVANCE OUTWASH
- OLYMPIA BEDS**
 - Qo NON-GLACIAL SEDIMENTS
- PRE-OLYMPIA DEPOSITS**
 - Qpog₁ GLACIAL TILL
 - Qpog_{1c} GLACIAL OUTWASH
 - Qpon_{1c} NON-GLACIAL, COARSE-GRAINED
 - Qpon_{1f} NON-GLACIAL, FINE-GRAINED
- OLDER PRE-OLYMPIA DEPOSITS**
 - Qpog_{2c} GLACIAL OUTWASH
 - Qpon_{2f} NON-GLACIAL, FINE-GRAINED
- TERTIARY**
 - T_h HAMMER BLUFF FORMATION
 - T_p PUGET GROUP
- WATER LEVEL AT TIME OF DRILLING (ATD)**
 - I STATIC WATER LEVEL MEASURED ON 6/19/08
 - DRY WELL SCREEN
 - DRY DRY ON 6/19/08
 - PERFORATED WELL CASING
 - OB OPEN BOTTOM WELL COMPLETION
 - SPRING

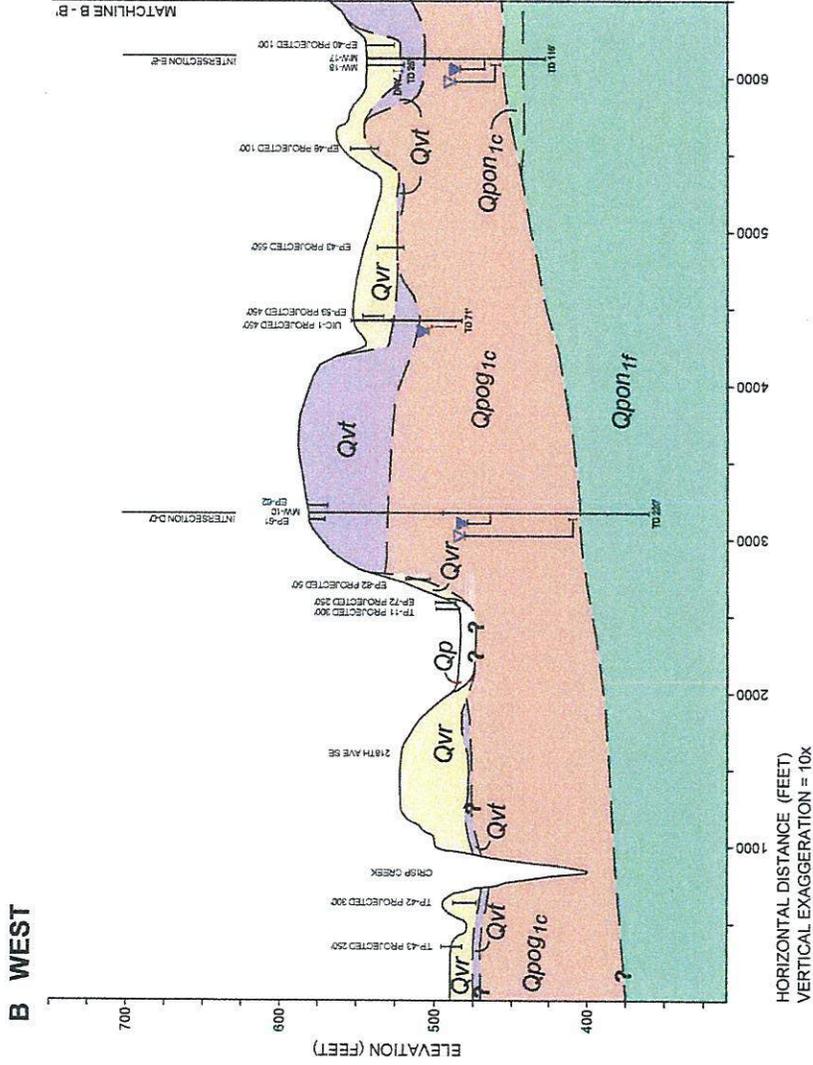


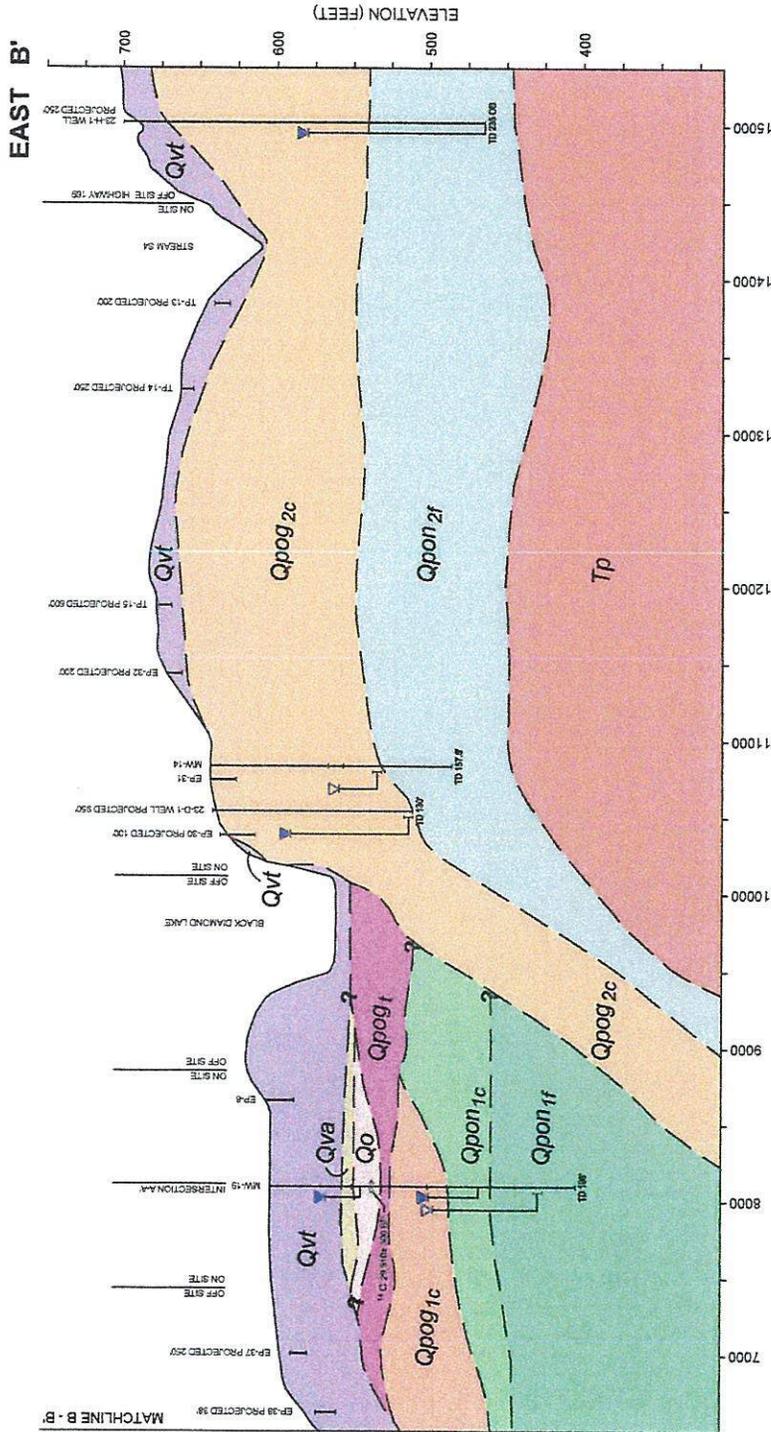
FIGURE 11A
DATE 9/08
PROJECT NO. KG060601A

GEOLOGIC CROSS-SECTION B - B'
THE VILLAGES
BLACK DIAMOND, WASHINGTON



LEGEND:

- RECENT/HOLOCENE**
Qal RIVER ALLUVIUM
Qp PEAT/ORGANIC DEPOSITS
Qmv MASS WASTING
- VASHON**
Qvt RECESSIONAL OUTWASH
Qvc ICE-CONTACT
Qvf LODGEMENT TILL
Qva ADVANCE OUTWASH
- OLYMPIA BEDS**
Qo NON-GLACIAL SEDIMENTS
- PRE-OLYMPIA DEPOSITS**
Qpog_{1t} GLACIAL TILL
Qpog_{1c} NON-GLACIAL, COARSE-GRAINED
Qpon_{1c} NON-GLACIAL, FINE-GRAINED
- OLDER PRE-OLYMPIA DEPOSITS**
Qpog_{2c} GLACIAL OUTWASH
Qpon_{2f} NON-GLACIAL, FINE-GRAINED
- TERTIARY**
Tt HAMMER BLUFF FORMATION
Tp PUGET GROUP
- ▲ WATER LEVEL AT TIME OF DRILLING (ATD)
 ▽ STATIC WATER LEVEL MEASURED ON 8/19/08
 I WELL SCREEN
 DRY ON 8/19/08
 PERFORATED WELL CASING
 OPEN BOTTOM WELL COMPLETION
 ○ SPRING



Associated Earth Sciences, Inc.
 090001 Villages at Black Diamond\090001 Geo Sections REV 7-09.dwg LAYOUT: Sect B-B-2 11x17

GEOLOGIC CROSS-SECTION B - B'
 THE VILLAGES
 BLACK DIAMOND, WASHINGTON

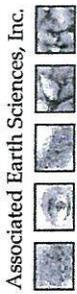
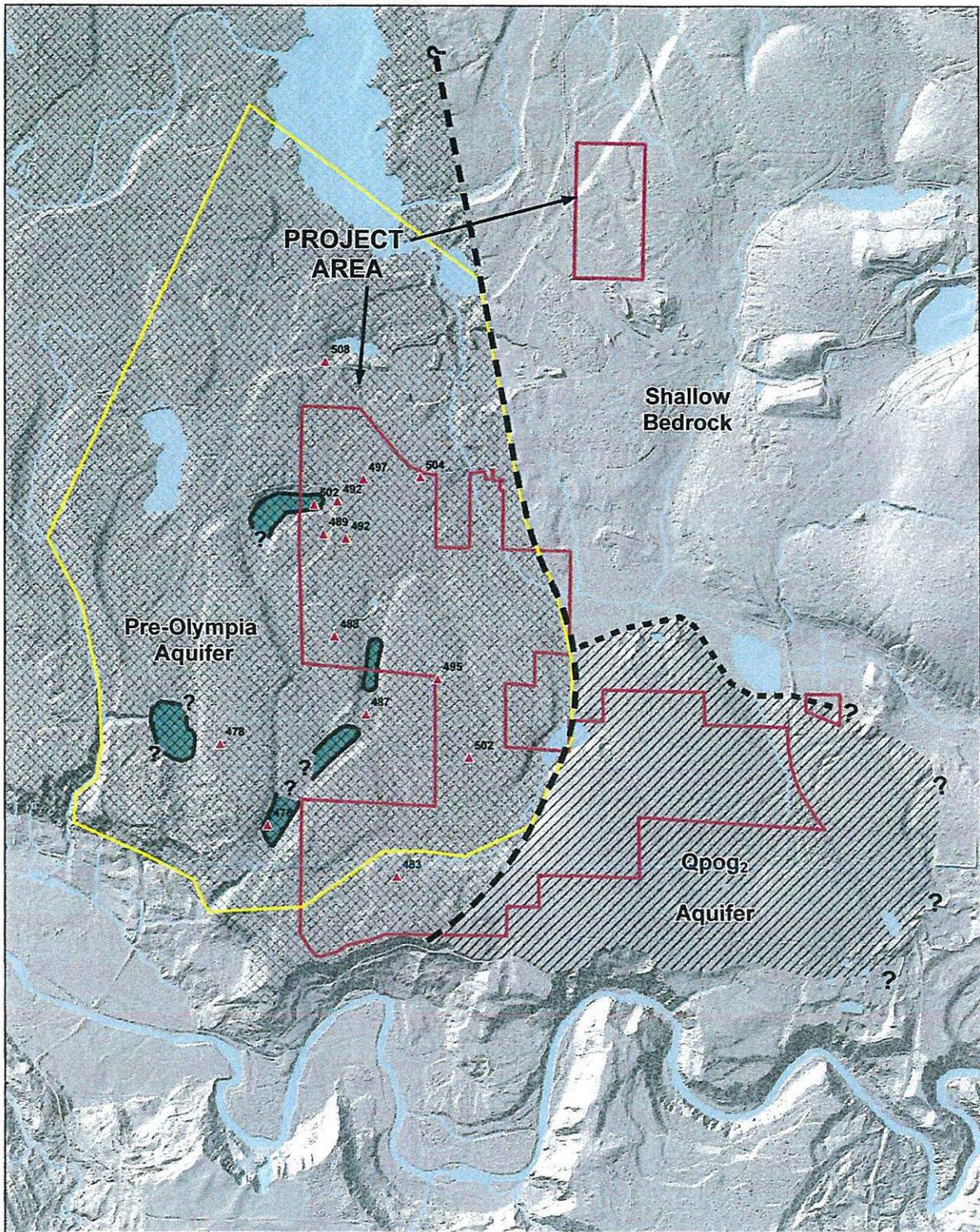


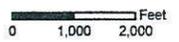
FIGURE 11B
 DATE 9/08
 PROJECT NO. KG060601A



Legend

-  514 Pre-Olympia Aquifer Well Location and Water Elevation from June 19, 2008
-  Till Window
-  Ground Water Flow Direction

-  Extent of the Pre-Olympia Aquifer
-  Extent of the Qpog₂ Aquifer
-  Area of Pre-Olympia Aquifer tributary to Crisp Creek Springs and Springs along Green River slope between Crisp Creek and southwest corner of Main Property



Reference: parcel outlines, waterbodies, King County GIS Center, acquired 2-08. Shaded relief and contours generated from 1 meter DEM acquired from King County GIS center, 2-08

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Associated Earth Sciences, Inc.

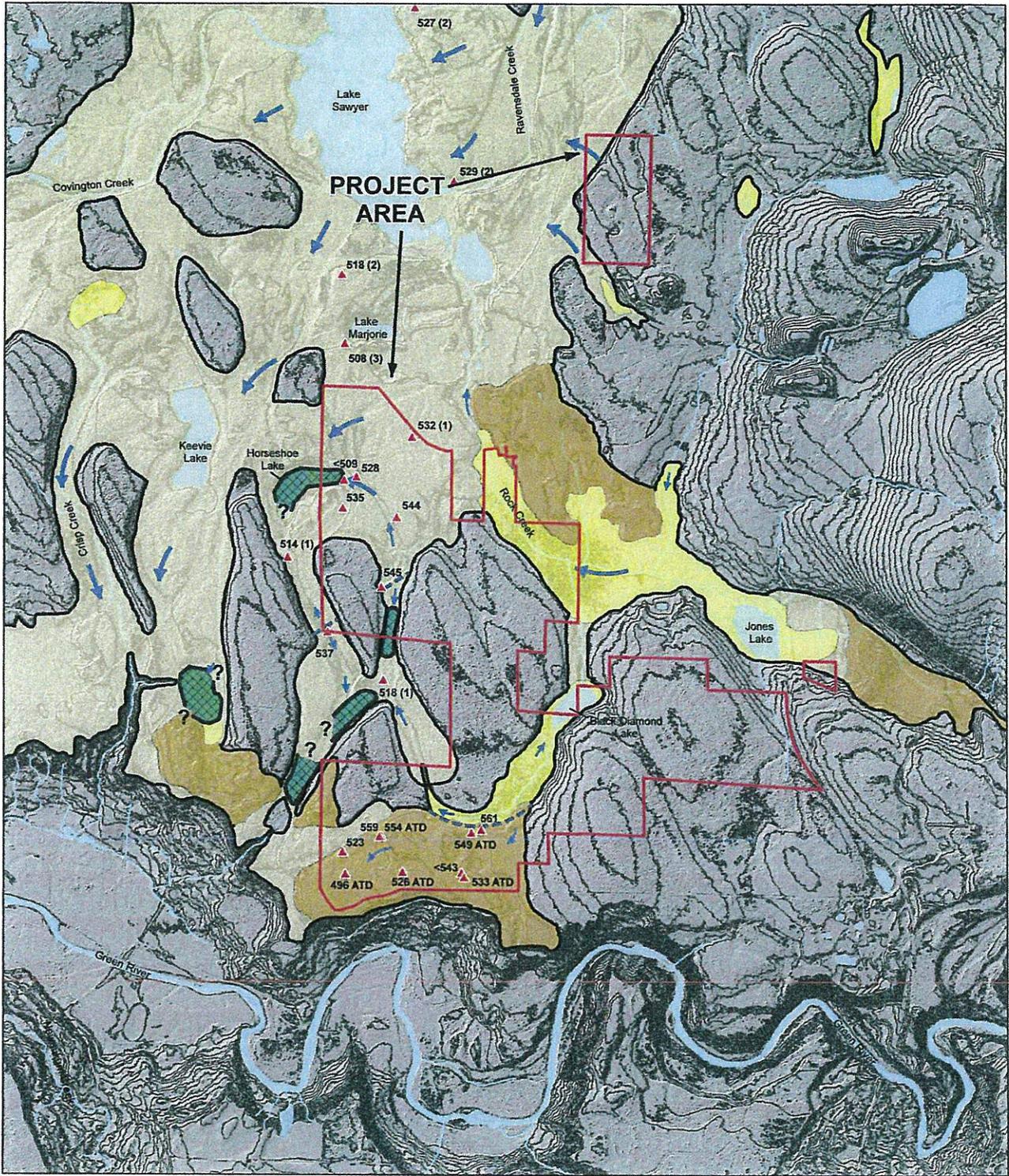


PRE-OLYMPIA AQUIFER AND Qpog₂ AQUIFER GROUND WATER DISTRIBUTION AND FLOW MAP
THE VILLAGES
BLACK DIAMOND, WASHINGTON

FIGURE 27

DATE 9/08

PROJ. NO. KG060601A



Legend

- Shallow Aquifer Geologic Units:**
- Qp - Peat/organic deposits
 - Qvr - Vashon Recessional outwash
 - Qvic - Vashon Ice Contact deposits

- Well Location and Water Elevation from June 19, 2008
 - (1) Elevation of top of Qvt; Well is dry, completed on top of Qvt.
 - (2) Water Level obtained from Hart Crowser, May 1990.
 - (3) Unknown completion, may represent lower aquifer.
- ATD - Water level at time of drilling.

- Ground Water Divide
- Till Window
- Ground Water Flow Direction
- Aquifer Distribution Line

N:\060601\KG060601A_Villages\Figures\F1_Tribal_Aquifer_Qvt_flow.mxd

REFERENCE: parcel outlines, waterbodies, King County GIS Center, acquired 2-08. Shaded relief and contours generated from 1 meter DEM acquired from King County GIS center, 2-08

0 1,000 2,000 Feet



Associated Earth Sciences, Inc.



**SHALLOW AQUIFER GROUND WATER
DISTRIBUTION AND FLOW MAP
THE VILLAGES
BLACK DIAMOND, WASHINGTON**

FIGURE 28

DATE 9/08

PROJ. NO. KG060601A

Geologic & Monitoring Well Construction Log

Project Number
KG060601A

Well Number
MW-14

Sheet
1 of 4

Project Name The Villages
 Elevation (Top of Well Casing) 644.54'
 Water Level Elevation 558.25'
 Drilling/Equipment Tacoma Pump & Drilling/Air Rotary
 Hammer Weight/Drop N/A

Location Black Diamond, WA
 Surface Elevation (ft) 641.72'
 Date Start/Finish 10/31/06 11/1/06
 Hole Diameter (in) 10" to 18 5/8" to TD

Depth (ft)	Water Level	WELL CONSTRUCTION	Blows/6"	Graphic Symbol	DESCRIPTION
		Aboveground monument with bollards			Surface Material: Road Fill/Topsoil Qpog _{zc} - Older Pre-Olympia Glacial Deposits, Coarse-Grained
5		10-inch diameter bentonite chip surface seal from 0 to 18 feet			At 5 feet: Moist, brown, silty fine to medium SAND to sandy SILT, few gravel, few silt/clay nodules, few roots/organics, trace oxidation.
10		6-inch I D. steel blank casing from approximately 2.5 feet above ground surface to 106.1 feet			At 10 feet: Moist, orangish brown, silty fine to medium SAND, trace gravel, trace coarse sand, trace silt/clay nodules; trace organics, moderate oxidation.
15					At 15 feet: As above.
20					At 20 feet: Slightly moist, orange-brown, silty fine SAND, moderate oxidation.
25					At 25 feet: Moist, orange-brown, silty fine to medium SAND, trace gravel, trace silt/clay nodules, moderate oxidation
30					At 30 feet: As above, except slightly more coarse sand and gravel
35					At 35 feet: Slightly moist, orange-brown, silty fine SAND, trace gravel; moderate oxidation.

NWMELL_060601A.GPJ BORING.GDT 6/9/08

Sampler Type (ST):

- | | | | |
|---|--|---|----------------|
|  2" OD Split Spoon Sampler (SPT) |  No Recovery |  M - Moisture | Logged by: BAA |
|  3" OD Split Spoon Sampler (D & M) |  Ring Sample |  Water Level (12/14/06) | Approved by: |
|  Grab Sample |  Shelby Tube Sample |  Water Level at time of drilling (ATD) | |

Geologic & Monitoring Well Construction Log



Project Number
KG060601A

Well Number
MW-14

Sheet
2 of 4

Project Name The Villages
 Elevation (Top of Well Casing) 644.54'
 Water Level Elevation 558.25'
 Drilling/Equipment Tacoma Pump & Drilling/Air Rotary
 Hammer Weight/Drop N/A

Location Black Diamond, WA
 Surface Elevation (ft) 641.72'
 Date Start/Finish 10/31/06 11/1/06
 Hole Diameter (in) 10" to 18/6" to TD

Depth (ft)	Water Level	WELL CONSTRUCTION	Blows/6"	Graphic Symbol	DESCRIPTION
					At 40 feet: Moist, orangish brown, silty fine SAND, trace dense clasts of fine to sandy SILT; moderate oxidation, clay present.
45					At 45 feet: As above.
50		6-inch steel blank casing from approximately 2.5 feet above ground surface to 106.1 feet			At 50 feet: As above.
55					At 55 feet: As above.
60					At 60 feet: Moist, orange-brown, silty fine SAND, few medium to coarse SAND; moderate oxidation, clay present.
65					At 65 feet: Moist, orange-brown (slightly more brown), silty fine SAND, few medium to coarse sand, clay present; moderate oxidation.
70					At 70 feet: As above with trace gravel.
75					At 75 feet: As above with few gravel. Cleaning clasts with water.
					Driller notes change at 77 feet. Driller notes more dense and gravelly at 77 feet

\\WELL_060601A.GPJ BORING.CDT 6/9/08

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample

- No Recovery
- Ring Sample
- Shelby Tube Sample

- M - Moisture
- Water Level (12/14/06)
- Water Level at time of drilling (ATD)

Logged by: BAA
 Approved by:



Project Number
KG060601A

Well Number
MW-14

Sheet
3 of 4

Project Name The Villages
 Elevation (Top of Well Casing) 644.54'
 Water Level Elevation 558.25'
 Drilling/Equipment Tacoma Pump & Drilling/Air Rotary
 Hammer Weight/Drop N/A

Location Black Diamond, WA
 Surface Elevation (ft) 641.72'
 Date Start/Finish 10/31/06 11/1/06
 Hole Diameter (in) 10" to 18'6" to TD

Depth (ft)	Water Level	WELL CONSTRUCTION	Blows/6"	Graphic Symbol	DESCRIPTION
85	▽				At 80 feet: Moist, orange-brown, silty fine SAND, few medium to coarse sand, few gravel, trace silt/clay nodules, abundant cuttings; moderate oxidation.
					At 85 feet: Moist, gray-brown, silty fine SAND, little gravel, few medium to coarse SAND (till?).
					Driller notes change at 87 feet, clay. Adding water to clean casing Brown, SILT/CLAY.
90		6-inch steel blank casing from approximately 2.5 feet above ground surface to 106.1 feet			At 90 feet: Wet, brown, silty fine to coarse SAND with gravel, moderate oxidation, abundant cuttings, trace silt/clay nodules. (Washed abundant orange and gray gravels)
95					At 95 feet: Wet, brown, fine to coarse sandy SILT, little gravel, silt/clay nodules; moderate oxidation. With BOC at 96 feet, driller notes producing ~1 to 2 gpm water, probably began at 89 feet.
					No free water at 98 feet.
100					At 100 feet: Moist, light orange-brown, silty fine SAND, few medium to coarse sand and gravel; moderate oxidation. No free water
					Driller notes more gravel and small boulders at 102 feet.
105		K-packer 8 inches long 2-foot riser, 5-inch I.D. steel blank casing from 103.5 to 105.5 feet 5-inch I.D. stainless steel wire-wrapped screen 0.010-inch slot width 105.5 to 110.5 feet			Increased moisture. Driller adding water. At 105 feet: Orange-brown, SILT/CLAY with few fine to coarse sand and gravel; minor oxidation.
					Driller notes from 108 to 110 feet formation producing 3 to 4 gpm.
110		1 foot silica sand Oglebay Norton 110.5 to 111.5 feet			Qpon ₂₁ - Older Pre-Olympia Non-Glacial Deposits, Fine-Grained At 110 feet: Wet, gray, SILT/CLAY, few fine to coarse sand and gravel.
					Sandstone boulder at ~114 feet, looks like bedrock at MW-11.
115		Hole plug and hydro plug 3/8-inch medium bentonite chips 111.5 to 155.5 feet			At 115 feet: Wet, gray, silty fine to coarse SAND with gravel (rounded); ~90 percent volcanic gravels. (Note sandstone boulder)
					Color change to olive-gray at ~119 feet.

VWELL 060601A.GPJ BORING.GDT 6/9/08

Sampler Type (ST):

- | | | | | | | |
|--|-----------------------------------|--|--------------------|--|---------------------------------------|----------------|
| | 2" OD Split Spoon Sampler (SPT) | | No Recovery | | M - Moisture | Logged by: BAA |
| | 3" OD Split Spoon Sampler (D & M) | | Ring Sample | | Water Level (12/14/06) | Approved by: |
| | Grab Sample | | Shelby Tube Sample | | Water Level at time of drilling (ATD) | |

Project Number KG060601A	Well Number MW-14	Sheet 4 of 4
Project Name The Villages	Location Black Diamond, WA	
Elevation (Top of Well Casing) 644.54'	Surface Elevation (ft) 641.72'	
Water Level Elevation 558.25'	Date Start/Finish 10/31/06 11/1/06	
Drilling/Equipment Tacoma Pump & Drilling/Air Rotary	Hole Diameter (in) 10" to 18'6" to TD	
Hammer Weight/Drop N/A		

Depth (ft)	Water Level	WELL CONSTRUCTION	Blows/6"	Graphic Symbol	DESCRIPTION
					At 120 feet: Very moist to wet, olive-gray, CLAY/SILT with few fine to coarse sand and gravel; possible trace organics.
125					At 125 feet: Wet, as above except little gravel and sand Driller notes "good clean clay" at 126 feet
130					At 130 feet: Very moist, gray and brown, fine sandy SILT/CLAY laminated.
135		Hole plug and hydro plug 3/8-inch medium bentonite chips 111.5 to 155.5 feet			At 135 feet: Very moist to wet, olive/blue-gray, fine sandy SILT/CLAY with few medium to coarse sand, trace gravel.
140					At 140 feet: Very moist, olive-gray/brown, SILT/CLAY, trace fine to medium sand.
145					At 145 feet: Very moist, gray, SILT/CLAY with fine sand, trace organics
150					At 150 feet: Very moist, dark gray, SILT/CLAY with fine sand scattered (ash too?).
155		Natural slough 155.5 to 157.5 feet			At 155 feet: Very moist, greenish gray, SILT/CLAY with fine sand.
					Boring terminated at 157.5 feet on 11/1/06

JWELL_060601A.GPJ BORING.GDT 6/9/08

Sampler Type (ST):

2" OD Split Spoon Sampler (SPT)	No Recovery	M - Moisture	Logged by: BAA
3" OD Split Spoon Sampler (D & M)	Ring Sample	Water Level (12/14/06)	Approved by:
Grab Sample	Shelby Tube Sample	Water Level at time of drilling (ATD)	

Attachment 9

Appendix 10 (Water Tables) to FEIS Appendix D

APPENDIX 10

Water Balance

Appendix 10

Pre-Developed Conditions

Basin	Total Area (ac)	Soil Type (acres)	
		Till	Outwash
<i>Horseshoe Lake Shallow Aquifer Basin</i>			
Basin 1 all	55.4	-	55.4
Basin 2 Qvr + till RO	104.9	-	104.9
Basin 3N Qvr + till RO	19.1	-	19.1
<i>subtotal</i>	179.4	-	179.4
<i>Pre-Olympia Aquifer Deeper Recharge Basin</i>			
Basin 2 Qvt RCH	4.0	4.0	-
Basin 3N Qvt RCH	113.4	113.4	-
Basin 3S all	57.6	45.7	11.9
Basin 4A - Western	131.4	131.4	-
Basin 4A - Qvic	7.2	-	7.2
Basin 4B - Northwestern Till	61.0	61.0	-
Basin 4B non-LID Qvic+Qvr	26.9	-	26.9
Basin 5 all	107.7	107.7	-
<i>subtotal</i>	509.2	463.2	46.0
<i>Qvic-LID Shallow Aquifer Basin</i>			
Basin 4B - Qvic_LID + 4B Eastern till RO	133.3	-	133.3
<i>subtotal</i>	133.3	-	133.3
<i>Qpog2 Deeper Recharge Basin</i>			
Basin 4C+4D+6 all	184.5	184.5	-
Basin 4A - Eastern	102.7	102.7	-
Basin 4B - Eastern Till RCH	7.8	7.8	-
<i>subtotal</i>	295.0	295.0	-
Total	1,116.9	758.2	358.7

Appendix 10

Pre-Developed Conditions Water Balance Summary

Basin	Acres	PPT (ac-ft)	ET (ac-ft)	RCH from OW (ac-ft)	RCH from TILL (ac-ft)	RCH from TILL RO onto OW (ac-ft)	Total RCH (ac-ft)	RO (ac-ft)
Horseshoe Lake Shallow Recharge Basin								
Basin 1 all	55.4	249.5	107.8	161.5	-	-	161.5	(19.8)
Basin 2 Qvr + till RO	104.9	472.5	204.2	305.8	-	6.1	311.9	(37.5)
Basin 3N Qvr + till RO	19.1	86.0	37.2	55.7	-	172.7	228.4	(6.8)
<i>subtotal</i>	179.4	808.0	349.2	523.0	-	178.8	701.8	(64.1)
Pre-Olympia Aquifer Deeper Recharge Basin								
Basin 2 Qvt RCH	4.0	18.0	7.8	-	5.6	-	5.6	(1.4)
Basin 3N Qvt RCH	113.4	510.8	220.8	-	157.8	-	157.8	(40.5)
Basin 3S all	57.6	259.4	112.1	34.7	63.6	69.6	167.9	(20.6)
Basin 4A - Western	131.4	591.8	255.8	-	182.9	-	182.9	153.2
Basin 4A - Qvic	7.2	32.4	14.0	21.0	-	-	21.0	(2.6)
Basin 4B - Northwestern Till	61.0	274.8	118.7	-	84.9	-	84.9	71.1 Footnote(1)
Basin 4B non-LID Qvic+Qvr	26.9	121.2	52.4	78.4	-	-	78.4	(9.6)
Basin 5	107.7	485.1	209.7	-	149.9	-	149.9	125.6
<i>subtotal</i>	509.2	2,293.5	991.2	134.1	644.6	69.6	848.3	275.1
Qvic-LID Shallow Aquifer Basin								
Basin 4B - Qvic_LID + till RO from Eastern till	133.3	600.4	259.5	388.6	-	11.9	400.5	(47.7)
<i>subtotal</i>	133.3	600.4	259.5	388.6	-	11.9	400.5	(47.7)
Qpog2 Deeper Recharge Basin								
Basin 4C+4D+6	184.5	831.0	359.2	-	256.8	-	256.8	215.1
Basin 4A - Eastern	102.7	462.6	199.9	-	142.9	-	142.9	119.7
Basin 4B - Eastern Till Qvt RCH	7.8	35.1	15.2	-	10.9	-	10.9	(2.8)
<i>subtotal</i>	295.0	1,328.7	574.3	-	410.5	-	410.5	332.0
TOTAL	1,116.9	5,030.7	2,174.2	1,045.6	1,055.2	260.3	2,361.1	495.4

(1) Till RO from 4B Northwestern Till would contribute to Qpog RCH offsite, but because infiltration of the RO occurs offsite, it is not included in the total Qpog RCH calculation

Appendix 10

Developed Conditions

Basin	Total Area (ac)	Hard Surface (acres)	Outwash		Till		zero check
			Forest (acres)	Grass (acres)	Forest (acres)	Grass (acres)	
Horseshoe Lake Shallow Aquifer Basin							
Basin 1	55.4	43.5	5.4	6.5	-	-	0.00
Basin 2 Qvr + Till Fill	104.9	80.7	-	14.3	-	9.9	0.00
Basin 3N Qvr	19.1	10.9	3.0	5.2	-	-	0.00
subtotal	179.4	135.1	8.4	26.0	-	9.9	(0)
Pre-Olympia Aquifer Deeper Recharge Basin							
Basin 2 Till	4.0	3.3	-	-	-	0.7	0.00
Basin 3N Till	113.4	42.0	-	-	49.3	22.1	0.00
Basin 3S All	57.6	34.6	-	3.7	6.4	12.9	0.00
Basin 4 (inc 4A West and 4B except LID and east)	226.5	65.8	9.9	7.0	115.8	28.0	0.00
Basin 5 all	107.7	17.7	-	-	79.3	10.7	0.00
subtotal	509.2	163.4	9.9	10.7	250.8	74.4	-
Qvic-LID Shallow Aquifer Basin							
Basin 4 Qvic_LID	133.3	91.5	1.1	40.7	-	-	0.00
subtotal	133.3	91.5	1.1	40.7	-	-	0.0
Qpog2 Deeper Recharge Basin							
Basin 4 (inc 4A east, 4B east, 4C)	201.8	95.1	-	-	51.3	55.4	0.00
Basin 6 all	93.2	8.5	-	-	80.4	4.3	0.00
subtotal	295.0	103.6	-	-	131.7	59.7	-
Total	1,116.9	493.6	19.4	77.4	382.5	144.0	0.0

Appendix 10

Preferred Action Developed Conditions Water Balance Summary

Basin	Acres	PPT (ac-ft)	ET (ac-ft)	RCH from OW (ac-ft)	RCH from TILL ⁽¹⁾ (ac-ft)	Total RCH (ac-ft)	RO (ac-ft)
Horseshoe Lake Shallow Recharge Basin							
Basin 1	55.4	249.5	50.5	34.7	-	34.7	164.4
Basin 2 Qvr ⁽¹⁾	104.9	472.5	92.7	41.7	13.8	55.5	324.4
Basin 3N Qvr	19.1	86.0	21.3	23.9	-	23.9	40.8
<i>subtotal</i>	179.4	808.0	164.5	100.3	13.8	114.0	529.6
Pre-Olympia Aquifer Deeper Recharge Basin							
Basin 2 Qvt RCH	4.0	18.0	3.3	-	1.0	1.0	13.7
Basin 3N Qvt RCH	113.4	510.8	158.7	-	99.4	99.4	252.7
Basin 3S	57.6	259.4	61.7	10.8	26.9	37.6	160.1
Basin 4 (inc 4A West and 4B except LID and east)	226.5	1,020.2	343.5	49.3	200.1	249.4	427.3
Basin 5	107.7	485.1	182.9	-	125.3	125.3	176.9
<i>subtotal</i>	509.2	2,293.5	750.1	60.0	452.6	512.6	1,030.8
Qvic-LID Shallow Aquifer Basin							
BasinQvic_LID	133.3	600.4	127.4	121.8	-	121.8	351.2
<i>subtotal</i>	133.3	600.4	127.4	121.8	-	121.8	351.2
Qpog2 Deeper Recharge Basin							
Basin 4 (inc 4A east, 4B east, 4C)	201.8	908.9	250.0	-	148.5	148.5	510.5
Basin 6	93.2	419.8	168.9	-	117.9	117.9	133.0
<i>subtotal</i>	295.0	1,328.7	418.9	-	266.4	266.4	643.4
TOTAL	1,116.9	5,030.7	1,460.9	282.1	732.7	1,014.8	2,555.0

⁽¹⁾ Recharge from till in Basin 2 Shallow is through about 9.9 AC of till fill over Qvr - eventually recharging shallow aquifer

Appendix 10

Basin 1 Developed Condition Summary Table											
Basin 1 Shallow AC		55.40									
Developed Conditions											
Month	PPT (ac-ft)	Estimated ET (ac-ft)	ET with exc. set = to PPT (ac-ft)	RCH from OW (ac-ft)	RCH from Till (ac-ft)	RO (ac-ft)					
Oct	23.2	3.6	3.8	3.8		15.8					
Nov	34.1	2.8	2.8	8.4		24.8					
Dec	34.5	2.5	2.5	6.6		25.3					
Jan	32.9	3.3	3.3	6.1		23.5					
Feb	24.8	3.1	3.1	4.4		17.3					
Mar	24.4	5.6	5.6	3.5		15.4					
Apr	19.5	5.9	5.9	1.9		11.7					
May	15.1	6.1	5.9	0.4		8.6					
Jun	13.6	5.7	5.2	0.3		7.6					
Jul	8.4	4.4	2.8	0.0		2.0					
Aug	7.5	3.6	3.3	0.0		4.0					
Sep	13.4	3.8	3.8	1.3		8.3					
TOTAL	249.5	50.5	47.8	34.7		164.4					
Basin 1 Monthly Water Budget for Outwash Grass Under Developed Conditions											
OW-Grass AC		6.50									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH predicted by WRI-01-110 (in)	RCH (ac-ft)	RO (inches)	RO (ac-ft)	
Oct	5.0	2.7	1.0	0.5	1.0	0.5	3.8	2.1	0.2	0.1	0.0
Nov	7.4	4.0	0.7	0.4	0.7	0.4	6.3	3.4	0.4	0.2	0.0
Dec	7.5	4.0	0.8	0.3	0.6	0.3	6.5	3.5	0.4	0.2	0.0
Jan	7.1	3.9	0.8	0.4	0.8	0.4	6.0	3.2	0.4	0.2	0.0
Feb	5.4	2.9	0.8	0.4	0.8	0.4	4.3	2.3	0.3	0.1	0.0
Mar	5.3	2.9	1.6	0.9	1.8	0.9	3.4	1.9	0.2	0.1	0.0
Apr	4.2	2.3	2.1	1.1	2.1	1.1	2.1	1.1	0.1	0.1	0.0
May	3.3	1.8	2.4	1.3	2.4	1.3	0.8	0.4	0.1	0.0	0.0
Jun	2.9	1.6	2.4	1.3	2.4	1.3	0.5	0.3	0.0	0.0	0.0
Jul	1.4	0.8	2.4	1.3	1.4	0.8	0.0	0.0	-1.0	-0.5	0.0
Aug	1.6	0.9	2.0	1.1	1.6	0.9	0.0	0.0	-0.4	-0.2	0.0
Sep	2.9	1.8	1.5	0.8	1.5	0.8	1.3	0.7	0.1	0.0	0.0
TOTAL	64.1	29.3	18.3	9.9	16.9	9.2	35.0	18.9	0.8	0.4	0.0
Basin 1 Monthly Water Budget for Outwash Forest Under Developed Conditions											
OW-forest AC		5.40									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH (in)	RCH ow (ac-ft)	RO (inches)	RO (ac-ft)	
Oct	5.0	2.3	1.2	0.5	1.2	0.5	3.9	1.7	0.0	0.0	(0.0)
Nov	7.4	3.3	0.7	0.3	0.7	0.3	6.7	3.0	0.0	0.0	0.0
Dec	7.5	3.4	0.6	0.3	0.6	0.3	6.9	3.1	0.0	0.0	0.0
Jan	7.1	3.2	0.8	0.4	0.8	0.4	6.3	2.8	0.0	0.0	(0.0)
Feb	5.4	2.4	0.8	0.4	0.8	0.4	4.6	2.0	0.0	0.0	0.0
Mar	5.3	2.4	1.7	0.8	1.7	0.8	3.6	1.6	0.0	0.0	(0.0)
Apr	4.2	1.9	2.5	1.1	2.5	1.1	1.7	0.8	0.0	0.0	0.0
May	3.3	1.5	3.8	1.7	3.3	1.5	0.0	0.0	(0.5)	(0.2)	0.0
Jun	2.9	1.3	4.2	1.9	2.9	1.3	0.0	0.0	(1.2)	(0.6)	0.0
Jul	1.4	0.6	3.7	1.7	1.4	0.6	0.0	0.0	(2.3)	(1.1)	0.0
Aug	1.8	0.7	1.8	0.8	1.6	0.7	0.0	0.0	(0.2)	(0.1)	0.0
Sep	2.9	1.3	1.6	0.7	1.6	0.7	1.3	0.6	0.0	0.0	0.0
TOTAL	54.1	24.3	23.4	10.5	19.1	8.6	34.98	15.7	(4.3)	(1.9)	(0.0)
Basin 1 Monthly Water Budget for Outwash Impervious Under Developed Conditions											
OW-imp AC		43.50									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH (in)	RCH (ac-ft)	RO (inches)	RO (ac-ft)	
Oct	5.0	18.2	0.7	2.6	0.7	2.6	0.0	0.0	4.3	15.7	0.0
Nov	7.4	26.8	0.6	2.2	0.6	2.2	0.0	0.0	6.8	24.6	0.0
Dec	7.5	27.1	0.5	2.0	0.5	2.0	0.0	0.0	6.9	25.1	0.0
Jan	7.1	25.8	0.7	2.5	0.7	2.5	0.0	0.0	8.4	23.3	0.0
Feb	5.4	19.5	0.6	2.3	0.6	2.3	0.0	0.0	4.7	17.2	0.0
Mar	5.3	19.2	1.1	3.9	1.1	3.9	0.0	0.0	4.2	15.3	0.0
Apr	4.2	15.3	1.0	3.7	1.0	3.7	0.0	0.0	3.2	11.7	0.0
May	3.3	11.9	0.9	3.1	0.9	3.1	0.0	0.0	2.4	8.8	0.0
Jun	2.9	10.7	0.7	2.5	0.7	2.5	0.0	0.0	2.2	8.1	0.0
Jul	1.4	5.0	0.4	1.4	0.4	1.4	0.0	0.0	1.0	3.8	0.0
Aug	1.6	5.9	0.5	1.7	0.5	1.7	0.0	0.0	1.2	4.2	0.0
Sep	2.9	10.5	0.6	2.2	0.6	2.2	0.0	0.0	2.3	8.3	0.0
TOTAL	54.1	195.9	8.3	30.1	8.3	30.1	0.0	0.0	45.8	165.8	0.0

Appendix 10

Basin 2 Qvt RCH to Qpo Developed Condition Summary Table						
Basin 2 Qpo AC		4.00				
Developed Conditions						
Month	PPT (ac-ft)	Estimated ET (ac-ft)	ET with exc. set = to PPT (ac-ft)	RCH from OW (ac-ft)	RCH from Till (ac-ft)	RO (ac-ft)
Oct	1.7	0.3	0.3	0.0	0.1	1.3
Nov	2.5	0.2	0.2	0.0	0.2	2.1
Dec	2.5	0.2	0.2	0.0	0.2	2.1
Jan	2.4	0.2	0.2	0.0	0.2	2.0
Feb	1.8	0.2	0.2	0.0	0.1	1.5
Mar	1.8	0.4	0.4	0.0	0.1	1.3
Apr	1.4	0.4	0.4	0.0	0.1	1.0
May	1.1	0.4	0.4	0.0	0.0	0.7
Jun	1.0	0.3	0.3	0.0	0.0	0.6
Jul	0.5	0.2	0.2	0.0	0.0	0.2
Aug	0.5	0.2	0.2	0.0	0.0	0.3
Sep	1.0	0.3	0.3	0.0	0.0	0.7
TOTAL	18.02	3.35	3.27	0.00	0.97	13.69

Table - Basin 2 Qvt RCH to Qpo Monthly Water Budget for Impervious Under Developed Conditions

Impervious AC		3.30									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH (in)	RCH (ac-ft)	RO (inches)	RO (ac-ft)	
Oct	5.0	1.4	0.7	0.2	0.7	0.2	0.0	0.0	4.3	1.2	0.0
Nov	7.4	2.0	0.6	0.2	0.6	0.2	0.0	0.0	6.8	1.9	0.0
Dec	7.5	2.1	0.5	0.1	0.5	0.1	0.0	0.0	6.9	1.9	0.0
Jan	7.1	2.0	0.7	0.2	0.7	0.2	0.0	0.0	6.4	1.8	0.0
Feb	5.4	1.5	0.6	0.2	0.6	0.2	0.0	0.0	4.7	1.3	0.0
Mar	5.3	1.5	1.1	0.3	1.1	0.3	0.0	0.0	4.2	1.2	0.0
Apr	4.2	1.2	1.0	0.3	1.0	0.3	0.0	0.0	3.2	0.9	0.0
May	3.3	0.9	0.9	0.2	0.9	0.2	0.0	0.0	2.4	0.7	0.0
Jun	2.9	0.8	0.7	0.2	0.7	0.2	0.0	0.0	2.2	0.6	0.0
Jul	1.4	0.4	0.4	0.1	0.4	0.1	0.0	0.0	1.0	0.3	0.0
Aug	1.6	0.4	0.5	0.1	0.5	0.1	0.0	0.0	1.2	0.3	0.0
Sep	2.9	0.8	0.6	0.2	0.6	0.2	0.0	0.0	2.3	0.6	0.0
TOTAL	54.1	14.9	8.3	2.3	8.3	2.3	0.0	0.0	45.8	12.6	0.0

Table - Basin 2 Qvt RCH to Qpo Monthly Water Budget for Till Grass Under Developed Conditions

Till-Grass AC		0.70									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH predicted by WRI-01-4110 (in)	RCH (ac-ft)	RO (inches)	RO (ac-ft)	
Oct	5.0	0.3	1.0	0.1	1.0	0.1	1.8	0.1	2.2	0.1	0.0
Nov	7.4	0.4	0.7	0.0	0.7	0.0	3.0	0.2	3.7	0.2	0.0
Dec	7.5	0.4	0.6	0.0	0.6	0.0	3.1	0.2	3.8	0.2	0.0
Jan	7.1	0.4	0.8	0.0	0.8	0.0	2.8	0.2	3.5	0.2	0.0
Feb	5.4	0.3	0.8	0.0	0.8	0.0	2.1	0.1	2.5	0.1	0.0
Mar	5.3	0.3	1.6	0.1	1.6	0.1	1.6	0.1	2.0	0.1	0.0
Apr	4.2	0.2	2.1	0.1	2.1	0.1	1.0	0.1	1.2	0.1	0.0
May	3.3	0.2	2.4	0.1	2.4	0.1	0.4	0.0	0.5	0.0	0.0
Jun	2.9	0.2	2.4	0.1	2.4	0.1	0.2	0.0	0.3	0.0	0.0
Jul	1.4	0.1	2.4	0.1	1.4	0.1	0.0	0.0	(1.0)	(0.1)	0.0
Aug	1.6	0.1	2.0	0.1	1.6	0.1	0.0	0.0	(0.4)	(0.0)	0.0
Sep	2.9	0.2	1.5	0.1	1.5	0.1	0.6	0.0	0.7	0.0	0.0
TOTAL	54.1	3.2	18.3	1.1	16.9	1.0	16.7	1.0	19.1	1.1	0.0

Appendix 10

Basin 2 Qvr+till-fill RCH to Shallow Aquifer Developed Condition Summary Table						
Basin 2 Shallow AC		104.90				
Developed Conditions						
Month	PPT (ac-ft)	Estimated ET (ac-ft)	ET with exc. set = to PPT (ac-ft)	RCH from OW (ac-ft)	RCH from Till (ac-ft)	RO (ac-ft)
Oct	44.0	6.8	6.8	4.5	1.5	31.2
Nov	64.6	5.4	5.4	7.6	2.5	49.2
Dec	65.3	4.8	4.8	7.7	2.6	50.2
Jan	62.3	8.3	6.3	7.1	2.3	46.6
Feb	47.0	5.9	5.9	5.1	1.7	34.3
Mar	46.2	10.6	10.6	4.1	1.4	30.2
Apr	37.0	10.9	10.9	2.4	0.8	22.8
May	28.6	10.6	10.6	1.0	0.3	16.7
Jun	25.7	9.6	9.6	0.8	0.2	15.3
Jul	12.2	7.4	5.4	0.0	0.0	4.7
Aug	14.2	7.1	6.4	0.0	0.0	7.1
Sep	25.4	7.3	7.3	1.5	0.5	16.0
TOTAL	472.49	92.66	89.94	41.67	13.78	324.38

Table 1a - Basin 2 Qvr+till-fill RCH to Shallow Aquifer Monthly Water Budget for Outwash Grass Under Develop

OW-Grass AC		14.30									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH predicted by WRI-01-4110 (in)	RCH (ac-ft)	RO (inches)	RO (ac-ft)	
Oct	5.0	6.0	1.0	1.2	1.0	1.2	3.8	4.5	0.2	0.3	0.0
Nov	7.4	8.8	0.7	0.8	0.7	0.8	6.3	7.6	0.4	0.5	0.0
Dec	7.5	8.9	0.6	0.7	0.6	0.7	6.5	7.7	0.4	0.5	0.0
Jan	7.1	8.5	0.8	1.0	0.8	1.0	6.0	7.1	0.4	0.4	0.0
Feb	5.4	6.4	0.8	1.0	0.8	1.0	4.3	5.1	0.3	0.3	0.0
Mar	5.3	6.3	1.6	2.0	1.6	2.0	3.4	4.1	0.2	0.3	0.0
Apr	4.2	5.0	2.1	2.4	2.1	2.4	2.1	2.4	0.1	0.2	0.0
May	3.3	3.9	2.4	2.9	2.4	2.9	0.8	1.0	0.1	0.1	0.0
Jun	2.9	3.5	2.4	2.9	2.4	2.9	0.5	0.6	0.0	0.0	0.0
Jul	1.4	1.7	2.4	2.8	1.4	1.7	0.0	0.0	-1.0	-1.2	0.0
Aug	1.6	1.9	2.0	2.4	1.6	1.9	0.0	0.0	-0.4	-0.4	0.0
Sep	2.9	3.5	1.5	1.8	1.5	1.8	1.3	1.5	0.1	0.1	0.0
TOTAL	64.1	64.4	18.3	21.8	16.9	20.2	35.0	41.7	0.8	1.0	0.0

Table 1c - Basin 2 Qvr+till-fill RCH to Shallow Aquifer Monthly Water Budget for Impervious Under Developed Co

Impervious AC		80.70									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH (in)	RCH (ac-ft)	RO (inches)	RO (ac-ft)	
Oct	5.0	33.8	0.7	4.8	0.7	4.8	0.0	0.0	4.3	29.1	0.0
Nov	7.4	49.7	0.6	4.0	0.6	4.0	0.0	0.0	6.8	45.7	0.0
Dec	7.5	50.2	0.5	3.6	0.5	3.6	0.0	0.0	6.9	46.6	0.0
Jan	7.1	47.9	0.7	4.7	0.7	4.7	0.0	0.0	6.4	43.2	0.0
Feb	5.4	36.2	0.6	4.3	0.8	4.3	0.0	0.0	4.7	31.9	0.0
Mar	5.3	35.6	1.1	7.3	1.1	7.3	0.0	0.0	4.2	28.3	0.0
Apr	4.2	28.4	1.0	6.8	1.0	6.8	0.0	0.0	3.2	21.7	0.0
May	3.3	22.0	0.9	5.7	0.9	5.7	0.0	0.0	2.4	16.3	0.0
Jun	2.9	19.8	0.7	4.7	0.7	4.7	0.0	0.0	2.2	15.1	0.0
Jul	1.4	9.3	0.4	2.6	0.4	2.6	0.0	0.0	1.0	6.7	0.0
Aug	1.6	11.0	0.5	3.1	0.5	3.1	0.0	0.0	1.2	7.9	0.0
Sep	2.9	19.5	0.6	4.2	0.6	4.2	0.0	0.0	2.3	15.3	0.0
TOTAL	54.1	363.5	8.3	55.8	8.3	55.8	0.0	0.0	45.8	307.7	0.0

Table 1d - Basin 2 Qvr+till-fill RCH to Shallow Aquifer Monthly Water Budget for Till Fill Grass Under Developed

Till-Fill Acreage		9.90									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH predicted by WRI-01-4110 (in)	RCH (ac-ft)	RO (inches)	RO (ac-ft)	
Oct	5.0	4.1	1.0	0.8	1.0	0.8	1.8	1.5	2.2	1.8	0.0
Nov	7.4	6.1	0.7	0.5	0.7	0.5	3.0	2.5	3.7	3.1	0.0
Dec	7.5	6.2	0.6	0.5	0.6	0.5	3.1	2.6	3.8	3.1	0.0
Jan	7.1	5.9	0.8	0.7	0.8	0.7	2.8	2.3	3.5	2.9	0.0
Feb	5.4	4.4	0.8	0.7	0.8	0.7	2.1	1.7	2.5	2.1	0.0
Mar	5.3	4.4	1.6	1.4	1.6	1.4	1.6	1.4	2.0	1.7	0.0
Apr	4.2	3.5	2.1	1.7	2.1	1.7	1.0	0.8	1.2	1.0	0.0
May	3.3	2.7	2.4	2.0	2.4	2.0	0.4	0.3	0.5	0.4	0.0
Jun	2.9	2.4	2.4	2.0	2.4	2.0	0.2	0.2	0.3	0.2	0.0
Jul	1.4	1.1	2.4	2.0	1.4	1.1	0.0	0.0	(1.0)	(0.8)	0.0
Aug	1.6	1.3	2.0	1.7	1.6	1.3	0.0	0.0	(0.4)	(0.3)	0.0
Sep	2.9	2.4	1.5	1.3	1.5	1.3	0.6	0.5	0.7	0.8	0.0
TOTAL	54.1	44.6	18.3	15.1	16.9	14.0	16.7	13.8	19.1	15.7	0.0

Appendix 10

Basin 3N (north) Qpog1 Developed Condition Summary Table

Basin 3 Qpo AC		113.40								
Developed Conditions										
Month	PPT (ac-ft)	Estimated ET (ac-ft)	ET with exc. set = to PPT (ac-ft)	RCH from OW (ac-ft)	RCH from Till (ac-ft)	RO (ac-ft)				
Oct	47.5	9.1	9.1	0.0	10.9	27.5			0.0	
Nov	69.8	6.2	6.2	0.0	18.7	45.0			0.0	
Dec	70.6	5.3	5.3	0.0	19.2	46.0			0.0	
Jan	67.4	7.3	7.3	0.0	17.6	42.5			0.0	
Feb	50.8	7.1	7.1	0.0	12.7	31.0			0.0	
Mar	50.0	13.9	13.9	0.0	10.0	26.1			0.0	
Apr	40.0	17.5	17.5	0.0	5.2	17.2			0.0	
May	30.9	23.0	20.8	0.0	0.7	7.2			0.0	
Jun	27.8	24.1	19.0	0.0	0.4	3.3			0.0	
Jul	13.1	21.1	9.6	0.0	0.0	-7.9			0.0	
Aug	15.4	12.8	11.3	0.0	0.0	2.6			0.0	
Sep	27.4	11.4	11.4	0.0	3.8	12.2			0.0	
TOTAL	510.77	158.67	138.56	0.00	99.37	252.74			0.0	

Table - Basin 3N (north) Qpog1 Monthly Water Budget for Outwash Grass Under Developed Conditions

OW-Grass AC		0.00									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH predicted by WRI-01-4110 (in)	RCH (ac-ft)	RO (inches)	RO (ac-ft)	
Oct	5.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nov	7.4	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dec	7.5	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jan	7.1	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Feb	5.4	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mar	5.3	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Apr	4.2	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
May	3.3	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jun	2.9	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jul	1.4	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aug	1.6	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sep	2.9	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	54.1	0.0	18.3	0.0	0.0	0.0	35.0	0.0	0.0	0.0	0.0

Table - Basin 3N (north) Qpog1 Monthly Water Budget for Outwash Forest Under Developed Conditions

OW-forest AC		0.00									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH (ppt-et) (in)	RCH ow (ac-ft)	RO (inches)	RO (ac-ft)	
Oct	5.0	0.0	1.2	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0
Nov	7.4	0.0	0.7	0.0	0.0	0.0	7.4	0.0	0.0	0.0	0.0
Dec	7.5	0.0	0.6	0.0	0.0	0.0	7.5	0.0	0.0	0.0	0.0
Jan	7.1	0.0	0.8	0.0	0.0	0.0	7.1	0.0	0.0	0.0	0.0
Feb	5.4	0.0	0.8	0.0	0.0	0.0	5.4	0.0	0.0	0.0	0.0
Mar	5.3	0.0	1.7	0.0	0.0	0.0	5.3	0.0	0.0	0.0	0.0
Apr	4.2	0.0	2.5	0.0	0.0	0.0	4.2	0.0	0.0	0.0	0.0
May	3.3	0.0	3.8	0.0	0.0	0.0	3.3	0.0	0.0	0.0	0.0
Jun	2.9	0.0	4.2	0.0	0.0	0.0	2.9	0.0	0.0	0.0	0.0
Jul	1.4	0.0	3.7	0.0	0.0	0.0	1.4	0.0	0.0	0.0	0.0
Aug	1.6	0.0	1.8	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0
Sep	2.9	0.0	1.6	0.0	0.0	0.0	2.9	0.0	0.0	0.0	0.0
TOTAL	54.1	0.0	23.4	0.0	0.0	0.0	54.05	0.0	0.0	0.0	0.0

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Table - Basin 3N (north) Qpog1 Monthly Water Budget for Impervious Under Developed Conditions

Impervious AC		42.00									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH (in)	RCH (ac-ft)	RO (inches)	RO (ac-ft)	
Oct	5.0	17.6	0.7	2.5	0.7	2.5	0.0	0.0	4.3	15.1	0.0
Nov	7.4	25.9	0.6	2.1	0.6	2.1	0.0	0.0	6.8	23.8	0.0
Dec	7.5	26.1	0.5	1.9	0.5	1.9	0.0	0.0	6.9	24.3	0.0
Jan	7.1	25.0	0.7	2.5	0.7	2.5	0.0	0.0	6.4	22.5	0.0
Feb	5.4	18.8	0.6	2.2	0.6	2.2	0.0	0.0	4.7	16.6	0.0
Mar	5.3	18.5	1.1	3.8	1.1	3.8	0.0	0.0	4.2	14.7	0.0
Apr	4.2	14.8	1.0	3.5	1.0	3.5	0.0	0.0	3.2	11.3	0.0
May	3.3	11.4	0.9	3.0	0.9	3.0	0.0	0.0	2.4	8.5	0.0
Jun	2.9	10.3	0.7	2.5	0.7	2.5	0.0	0.0	2.2	7.8	0.0
Jul	1.4	4.9	0.4	1.4	0.4	1.4	0.0	0.0	1.0	3.5	0.0
Aug	1.6	5.7	0.5	1.6	0.5	1.6	0.0	0.0	1.2	4.1	0.0
Sep	2.9	10.2	0.6	2.2	0.6	2.2	0.0	0.0	2.3	8.0	0.0
TOTAL	54.1	189.2	8.3	29.1	8.3	29.1	0.0	0.0	45.8	160.1	0.0

Table - Basin 3N (north) Qpog1 Monthly Water Budget for Till Forest Under Developed Conditions

Till-Forest AC		49.30									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH predicted by WRI-D1-4110 (in)	RCH (ac-ft)	RO (inches)	RO (ac-ft)	
Oct	5.0	20.7	1.2	4.7	1.2	4.7	1.9	7.6	2.0	8.3	0.0
Nov	7.4	30.4	0.7	2.8	0.7	2.8	3.2	13.1	3.5	14.4	0.0
Dec	7.5	30.7	0.6	2.4	0.6	2.4	3.3	13.5	3.6	14.8	0.0
Jan	7.1	29.3	0.8	3.3	0.8	3.3	3.0	12.4	3.3	13.6	0.0
Feb	5.4	22.1	0.8	3.4	0.8	3.4	2.2	8.9	2.4	9.8	0.0
Mar	5.3	21.7	1.7	7.1	1.7	7.1	1.7	7.0	1.9	7.6	0.0
Apr	4.2	17.4	2.5	10.2	2.5	10.2	0.8	3.4	0.9	3.7	0.0
May	3.3	13.4	3.8	15.6	3.3	13.4	0.0	0.0	(0.5)	(2.1)	0.0
Jun	2.9	12.1	4.2	17.2	2.9	12.1	0.0	0.0	(1.2)	(5.1)	0.0
Jul	1.4	5.7	3.7	15.3	1.4	5.7	0.0	0.0	(2.3)	(9.6)	0.0
Aug	1.6	6.7	1.8	7.5	1.6	6.7	0.0	0.0	(0.2)	(0.8)	0.0
Sep	2.9	11.9	1.6	6.4	1.6	6.4	0.6	2.6	0.7	2.9	0.0
TOTAL	54.1	222.1	23.4	96.0	19.1	78.3	16.7	68.6	14.0	57.5	0.0

Table - Basin 3N (north) Qpog1 Monthly Water Budget for Till Grass Under Developed Conditions

Till-Grass AC		22.10									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH predicted by WRI-D1-4110 (in)	RCH (ac-ft)	RO (inches)	RO (ac-ft)	
Oct	5.0	9.3	1.0	1.9	1.0	1.9	1.8	3.3	2.2	4.1	0.0
Nov	7.4	13.6	0.7	1.2	0.7	1.2	3.0	5.6	3.7	6.8	0.0
Dec	7.5	13.8	0.6	1.0	0.6	1.0	3.1	5.7	3.8	7.0	0.0
Jan	7.1	13.1	0.8	1.5	0.8	1.5	2.8	5.2	3.5	6.4	0.0
Feb	5.4	9.9	0.8	1.5	0.8	1.5	2.1	3.8	2.5	4.6	0.0
Mar	5.3	9.7	1.6	3.0	1.6	3.0	1.6	3.0	2.0	3.7	0.0
Apr	4.2	7.8	2.1	3.8	2.1	3.8	1.0	1.8	1.2	2.2	0.0
May	3.3	6.0	2.4	4.4	2.4	4.4	0.4	0.7	0.5	0.9	0.0
Jun	2.9	5.4	2.4	4.4	2.4	4.4	0.2	0.4	0.3	0.5	0.0
Jul	1.4	2.6	2.4	4.4	1.4	2.6	0.0	0.0	(1.0)	(1.8)	0.0
Aug	1.6	3.0	2.0	3.7	1.6	3.0	0.0	0.0	(0.4)	(0.7)	0.0
Sep	2.9	5.3	1.5	2.8	1.5	2.8	0.6	1.1	0.7	1.4	0.0
TOTAL	54.1	99.5	18.3	33.6	16.9	31.2	16.7	30.8	19.1	35.1	0.0

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Basin 3N (north) Shallow Developed Condition Summary Table						
Basin 3 Shallow AC	19.10					
Developed Conditions						
Month	PPT (ac-ft)	Estimated ET (ac-ft)	ET with exc. set = to PPT (ac-ft)	RCH from OW (ac-ft)	RCH from Till (ac-ft)	RO (ac-ft)
Oct	8.0	1.4	1.4	2.6	0.0	4.0
Nov	11.8	1.0	1.0	4.4	0.0	6.3
Dec	11.9	0.9	0.9	4.5	0.0	6.5
Jan	11.3	1.2	1.2	4.2	0.0	6.0
Feb	8.6	1.1	1.1	3.0	0.0	4.4
Mar	8.4	2.1	2.1	2.4	0.0	3.9
Apr	6.7	2.4	2.4	1.3	0.0	3.0
May	5.2	2.8	2.6	0.4	0.0	2.1
Jun	4.7	2.7	2.4	0.2	0.0	1.7
Jul	2.2	2.3	1.3	0.0	0.0	-0.1
Aug	2.6	1.7	1.5	0.0	0.0	0.9
Sep	4.6	1.6	1.6	0.9	0.0	2.1
TOTAL	86.03	21.30	19.64	23.90	0.00	40.83

Table 1a - Basin 3N (north) Shallow Monthly Water Budget for Outwash Grass Under Developed Conditions

OW-Grass Acreage	5.20										
Developed Conditions											
Month	PPT (Inches)	PPT (ac-ft)	Estimated ET (Inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (Inches)	ET with exc. set = to PPT (ac-ft)	RCH predicted by WRI-01-4110 (in)	RCH (ac-ft)	RO (Inches)	RO (ac-ft)	
Oct	5.0	2.2	1.0	0.4	1.0	0.4	3.8	1.6	0.2	0.1	0.0
Nov	7.4	3.2	0.7	0.3	0.7	0.3	6.3	2.7	0.4	0.2	0.0
Dec	7.5	3.2	0.6	0.2	0.6	0.2	6.5	2.8	0.4	0.2	0.0
Jan	7.1	3.1	0.8	0.3	0.8	0.3	6.0	2.6	0.4	0.2	0.0
Feb	5.4	2.3	0.8	0.4	0.8	0.4	4.3	1.9	0.3	0.1	0.0
Mar	5.3	2.3	1.6	0.7	1.6	0.7	3.4	1.5	0.2	0.1	0.0
Apr	4.2	1.8	2.1	0.9	2.1	0.9	2.1	0.9	0.1	0.1	0.0
May	3.3	1.4	2.4	1.0	2.4	1.0	0.8	0.4	0.1	0.0	0.0
Jun	2.9	1.3	2.4	1.0	2.4	1.0	0.5	0.2	0.0	0.0	0.0
Jul	1.4	0.6	2.4	1.0	1.4	0.6	0.0	0.0	-1.0	-0.4	0.0
Aug	1.6	0.7	2.0	0.9	1.6	0.7	0.0	0.0	-0.4	-0.2	0.0
Sep	2.9	1.3	1.5	0.7	1.5	0.7	1.3	0.6	0.1	0.0	0.0
TOTAL	54.1	23.4	18.3	7.9	16.9	7.3	35.0	15.2	0.8	0.4	0.0

Table 1b - Basin 3N (north) Shallow Monthly Water Budget for Outwash Forest Under Developed Conditions

OW-forest acreage	3.00										
Developed Conditions											
Month	PPT (Inches)	PPT (ac-ft)	Estimated ET (Inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (Inches)	ET with exc. set = to PPT (ac-ft)	RCH [ppt-et] (in)	RCH ow (ac-ft)	RO (Inches)	RO (ac-ft)	
Oct	5.0	1.3	1.2	0.3	1.2	0.3	3.9	1.0	0.0	0.0	0.0
Nov	7.4	1.8	0.7	0.2	0.7	0.2	6.7	1.7	0.0	0.0	0.0
Dec	7.5	1.9	0.6	0.1	0.6	0.1	6.9	1.7	0.0	0.0	0.0
Jan	7.1	1.8	0.8	0.2	0.8	0.2	6.3	1.6	0.0	0.0	(0.0)
Feb	5.4	1.3	0.8	0.2	0.8	0.2	4.6	1.1	0.0	0.0	0.0
Mar	5.3	1.3	1.7	0.4	1.7	0.4	3.6	0.9	0.0	0.0	(0.0)
Apr	4.2	1.1	2.5	0.6	2.5	0.6	1.7	0.4	0.0	0.0	0.0
May	3.3	0.8	3.8	0.9	3.3	0.8	0.0	0.0	(0.5)	(0.1)	0.0
Jun	2.9	0.7	4.2	1.0	2.9	0.7	0.0	0.0	(1.2)	(0.3)	0.0
Jul	1.4	0.3	3.7	0.9	1.4	0.3	0.0	0.0	(2.3)	(0.6)	0.0
Aug	1.6	0.4	1.8	0.5	1.6	0.4	0.0	0.0	(0.2)	(0.0)	0.0
Sep	2.9	0.7	1.6	0.4	1.6	0.4	1.3	0.3	0.0	0.0	(0.0)
TOTAL	54.1	13.5	23.4	5.8	19.1	4.8	34.98	8.7	(4.3)	(1.1)	0.0

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Table 1c - Basin 3N (north) Shallow Monthly Water Budget for Impervious Under Developed Conditions											
Impervious Acreage		10.90									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH (in)	RCH (ac-ft)	RO (inches)	RO (ac-ft)	
Oct	5.0	4.6	0.7	0.6	0.7	0.6	0.0	0.0	4.3	3.9	0.0
Nov	7.4	6.7	0.6	0.5	0.6	0.5	0.0	0.0	6.8	6.2	0.0
Dec	7.5	6.8	0.5	0.5	0.5	0.5	0.0	0.0	6.9	6.3	0.0
Jan	7.1	6.5	0.7	0.6	0.7	0.6	0.0	0.0	6.4	5.8	0.0
Feb	5.4	4.9	0.6	0.6	0.6	0.6	0.0	0.0	4.7	4.3	0.0
Mar	5.3	4.8	1.1	1.0	1.1	1.0	0.0	0.0	4.2	3.8	0.0
Apr	4.2	3.8	1.0	0.9	1.0	0.9	0.0	0.0	3.2	2.9	0.0
May	3.3	3.0	0.9	0.8	0.9	0.8	0.0	0.0	2.4	2.2	0.0
Jun	2.9	2.7	0.7	0.6	0.7	0.6	0.0	0.0	2.2	2.0	0.0
Jul	1.4	1.3	0.4	0.4	0.4	0.4	0.0	0.0	1.0	0.9	0.0
Aug	1.6	1.5	0.5	0.4	0.5	0.4	0.0	0.0	1.2	1.1	0.0
Sep	2.9	2.6	0.6	0.6	0.6	0.6	0.0	0.0	2.3	2.1	0.0
TOTAL	54.1	49.1	8.3	7.5	8.3	7.5	0.0	0.0	45.8	41.6	0.0

Table 1d - Basin 3N (north) Shallow Monthly Water Budget for Till Forest Under Developed Conditions											
Till-Forest Acreage		0.00									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH predicted by WRI-01-4110 (in)	RCH (ac-ft)	RO (inches)	RO (ac-ft)	
Oct	5.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nov	7.4	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dec	7.5	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jan	7.1	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Feb	5.4	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mar	5.3	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Apr	4.2	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
May	3.3	0.0	3.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jun	2.9	0.0	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jul	1.4	0.0	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aug	1.6	0.0	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sep	2.9	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	54.1	0.0	23.4	0.0	0.0	0.0	16.7	0.0	0.0	0.0	0.0

Table 1e - Basin 3N (north) Shallow Monthly Water Budget for Till Grass Under Developed Conditions											
Till-Grass Acreage		0.00									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH predicted by WRI-01-4110 (in)	RCH (ac-ft)	RO (inches)	RO (ac-ft)	
Oct	5.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nov	7.4	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dec	7.5	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jan	7.1	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Feb	5.4	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mar	5.3	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Apr	4.2	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
May	3.3	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jun	2.9	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jul	1.4	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aug	1.6	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sep	2.9	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	54.1	0.0	18.3	0.0	0.0	0.0	16.7	0.0	0.0	0.0	0.0

Appendix 10

Basin 3S (south) Developed Condition Summary Table											
Basin 3S Qpo AC		57.60									
Developed Conditions											
Month	PPT (ac-ft)	Estimated ET (ac-ft)	ET with exc. set = to PPT (ac-ft)	RCH from OW (ac-ft)	RCH from Till (ac-ft)	RO (ac-ft)					
Oct	24.1	4.1	4.1	1.2	2.9	16.0					0.0
Nov	35.5	3.0	3.0	2.0	5.0	25.5					0.0
Dec	35.9	2.7	2.7	2.0	5.1	26.1					0.0
Jan	34.2	3.6	3.6	1.8	4.7	24.2					0.0
Feb	25.8	3.4	3.4	1.3	3.4	17.7					0.0
Mar	25.4	6.3	6.3	1.1	2.7	15.4					0.0
Apr	20.3	7.1	7.1	0.6	1.5	11.1					0.0
May	15.7	7.8	7.5	0.2	0.4	7.2					0.0
Jun	14.1	7.6	8.9	0.2	0.3	6.1					0.0
Jul	6.7	6.4	3.8	0.0	0.0	0.3					0.0
Aug	7.8	5.1	4.5	0.0	0.0	2.8					0.0
Sep	13.9	4.8	4.8	0.4	1.0	7.8					0.0
TOTAL	259.44	61.66	57.51	10.78	26.86	160.13					0.0

Table - Basin 3S (south) Monthly Water Budget for Outwash Grass Under Developed Conditions											
OW-Grass AC		3.70									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH predicted by WRI-01-4110 (in)	RCH (ac-ft)	RO (inches)	RO (ac-ft)	
Oct	5.0	1.6	1.0	0.3	1.0	0.3	3.8	1.2	0.2	0.1	0.0
Nov	7.4	2.3	0.7	0.2	0.7	0.2	6.3	2.0	0.4	0.1	0.0
Dec	7.5	2.3	0.6	0.2	0.6	0.2	6.5	2.0	0.4	0.1	0.0
Jan	7.1	2.2	0.8	0.2	0.8	0.2	6.0	1.8	0.4	0.1	0.0
Feb	5.4	1.7	0.8	0.2	0.8	0.2	4.3	1.3	0.3	0.1	0.0
Mar	5.3	1.6	1.6	0.5	1.6	0.5	3.4	1.1	0.2	0.1	0.0
Apr	4.2	1.3	2.1	0.8	2.1	0.8	2.1	0.6	0.1	0.0	0.0
May	3.3	1.0	2.4	0.7	2.4	0.7	0.8	0.2	0.1	0.0	0.0
Jun	2.9	0.9	2.4	0.7	2.4	0.7	0.5	0.2	0.0	0.0	0.0
Jul	1.4	0.4	2.4	0.7	1.4	0.4	0.0	0.0	-1.0	-0.3	0.0
Aug	1.6	0.5	2.0	0.8	1.6	0.5	0.0	0.0	-0.4	-0.1	0.0
Sep	2.9	0.9	1.5	0.5	1.5	0.5	1.3	0.4	0.1	0.0	0.0
TOTAL	54.1	16.7	18.3	5.6	16.9	5.2	35.0	10.8	0.8	0.2	0.0

Table - Basin 3S (south) Monthly Water Budget for Outwash Forest Under Developed Conditions											
OW-forest AC		0.00									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH [ppt-et] (in)	RCH ow (ac-ft)	RO (inches)	RO (ac-ft)	
Oct	5.0	0.0	1.2	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0
Nov	7.4	0.0	0.7	0.0	0.0	0.0	7.4	0.0	0.0	0.0	0.0
Dec	7.5	0.0	0.6	0.0	0.0	0.0	7.5	0.0	0.0	0.0	0.0
Jan	7.1	0.0	0.8	0.0	0.0	0.0	7.1	0.0	0.0	0.0	0.0
Feb	5.4	0.0	0.8	0.0	0.0	0.0	5.4	0.0	0.0	0.0	0.0
Mar	5.3	0.0	1.7	0.0	0.0	0.0	5.3	0.0	0.0	0.0	0.0
Apr	4.2	0.0	2.5	0.0	0.0	0.0	4.2	0.0	0.0	0.0	0.0
May	3.3	0.0	3.8	0.0	0.0	0.0	3.3	0.0	0.0	0.0	0.0
Jun	2.9	0.0	4.2	0.0	0.0	0.0	2.9	0.0	0.0	0.0	0.0
Jul	1.4	0.0	3.7	0.0	0.0	0.0	1.4	0.0	0.0	0.0	0.0
Aug	1.6	0.0	1.8	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0
Sep	2.9	0.0	1.6	0.0	0.0	0.0	2.9	0.0	0.0	0.0	0.0
TOTAL	54.1	0.0	23.4	0.0	0.0	0.0	54.05	0.0	0.0	0.0	0.0

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Table - Basin 3S (south) Monthly Water Budget for Impervious Under Developed Conditions											
Impervious AC		34.60									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH (in)	RCH (ac-ft)	RO (Inches)	RO (ac-ft)	
Oct	5.0	14.5	0.7	2.0	0.7	2.0	0.0	0.0	4.3	12.5	0.0
Nov	7.4	21.3	0.6	1.7	0.6	1.7	0.0	0.0	6.8	19.6	0.0
Dec	7.5	21.5	0.5	1.6	0.5	1.5	0.0	0.0	6.9	20.0	0.0
Jan	7.1	20.6	0.7	2.0	0.7	2.0	0.0	0.0	6.4	18.5	0.0
Feb	5.4	15.5	0.6	1.8	0.6	1.8	0.0	0.0	4.7	13.7	0.0
Mar	5.3	15.3	1.1	3.1	1.1	3.1	0.0	0.0	4.2	12.1	0.0
Apr	4.2	12.2	1.0	2.9	1.0	2.9	0.0	0.0	3.2	9.3	0.0
May	3.3	9.4	0.9	2.5	0.9	2.5	0.0	0.0	2.4	7.0	0.0
Jun	2.9	8.5	0.7	2.0	0.7	2.0	0.0	0.0	2.2	6.5	0.0
Jul	1.4	4.0	0.4	1.1	0.4	1.1	0.0	0.0	1.0	2.9	0.0
Aug	1.6	4.7	0.5	1.3	0.5	1.3	0.0	0.0	1.2	3.4	0.0
Sep	2.9	8.4	0.6	1.8	0.6	1.8	0.0	0.0	2.3	6.6	0.0
TOTAL	54.1	155.8	8.3	23.9	8.3	23.9	0.0	0.0	45.8	131.9	0.0

Table - Basin 3S (south) Monthly Water Budget for Till Forest Under Developed Conditions											
Till-Forest AC		6.40									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH predicted by WRI-01-4110 (in)	RCH (ac-ft)	RO (Inches)	RO (ac-ft)	
Oct	5.0	2.7	1.2	0.6	1.2	0.6	1.9	1.0	2.0	1.1	0.0
Nov	7.4	3.9	0.7	0.4	0.7	0.4	3.2	1.7	3.5	1.9	0.0
Dec	7.5	4.0	0.6	0.3	0.6	0.3	3.3	1.8	3.6	1.9	0.0
Jan	7.1	3.8	0.8	0.4	0.8	0.4	3.0	1.6	3.3	1.8	0.0
Feb	5.4	2.9	0.8	0.4	0.8	0.4	2.2	1.2	2.4	1.3	0.0
Mar	5.3	2.8	1.7	0.9	1.7	0.9	1.7	0.9	1.9	1.0	0.0
Apr	4.2	2.3	2.5	1.3	2.5	1.3	0.8	0.4	0.9	0.5	0.0
May	3.3	1.7	3.8	2.0	3.3	1.7	0.0	0.0	(0.5)	(0.3)	0.0
Jun	2.9	1.6	4.2	2.2	2.9	1.6	0.0	0.0	(1.2)	(0.7)	0.0
Jul	1.4	0.7	3.7	2.0	1.4	0.7	0.0	0.0	(2.3)	(1.2)	0.0
Aug	1.6	0.9	1.8	1.0	1.6	0.9	0.0	0.0	(0.2)	(0.1)	0.0
Sep	2.9	1.5	1.6	0.8	1.6	0.8	0.6	0.3	0.7	0.4	0.0
TOTAL	54.1	28.8	23.4	12.6	19.1	10.2	16.7	8.9	14.0	7.5	0.0

Table - Basin 3S (south) Monthly Water Budget for Till Grass Under Developed Conditions											
Till-Grass AC		12.90									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH predicted by WRI-01-4110 (in)	RCH (ac-ft)	RO (inches)	RO (ac-ft)	
Oct	5.0	5.4	1.0	1.1	1.0	1.1	1.8	1.9	2.2	2.4	0.0
Nov	7.4	7.9	0.7	0.7	0.7	0.7	3.0	3.3	3.7	4.0	0.0
Dec	7.5	8.0	0.6	0.6	0.6	0.6	3.1	3.3	3.8	4.1	0.0
Jan	7.1	7.7	0.8	0.9	0.8	0.9	2.8	3.1	3.5	3.7	0.0
Feb	5.4	5.8	0.8	0.9	0.8	0.9	2.1	2.2	2.5	2.7	0.0
Mar	5.3	5.7	1.6	1.8	1.6	1.8	1.6	1.8	2.0	2.2	0.0
Apr	4.2	4.5	2.1	2.2	2.1	2.2	1.0	1.1	1.2	1.3	0.0
May	3.3	3.5	2.4	2.6	2.4	2.6	0.4	0.4	0.5	0.5	0.0
Jun	2.9	3.2	2.4	2.6	2.4	2.6	0.2	0.3	0.3	0.3	0.0
Jul	1.4	1.6	2.4	2.6	1.4	1.5	0.0	0.0	(1.0)	(1.1)	0.0
Aug	1.6	1.8	2.0	2.2	1.6	1.8	0.0	0.0	(0.4)	(0.4)	0.0
Sep	2.9	3.1	1.5	1.7	1.5	1.7	0.6	0.7	0.7	0.8	0.0
TOTAL	54.1	58.1	18.3	19.6	16.9	18.2	16.7	18.0	19.1	20.5	0.0

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Basin 4 Pre-Olympia Developed Condition Summary Table						
Basin 4 Qpo AC	226.50					
Developed Conditions						
Month	PPT (ac-ft)	Estimated ET (ac-ft)	ET with exc. set = to PPT (ac-ft)	RCH from OW (ac-ft)	RCH from Till (ac-ft)	RO (ac-ft)
Oct	94.9	18.9	18.9	5.4	22.1	48.6
Nov	139.5	12.4	12.4	9.2	37.9	79.9
Dec	141.0	10.7	10.7	9.5	39.0	81.8
Jan	134.6	14.7	14.7	8.7	35.8	75.5
Feb	101.5	14.6	14.6	6.3	25.8	55.0
Mar	99.8	28.8	28.8	4.9	20.2	45.8
Apr	79.8	37.6	37.6	2.6	10.3	29.3
May	61.7	51.4	45.9	0.5	0.9	9.0
Jun	55.5	54.7	41.7	0.3	0.6	0.0
Jul	26.2	48.1	20.8	0.0	0.0	-21.9
Aug	30.8	27.4	24.4	0.0	0.0	3.3
Sep	54.7	24.2	24.2	1.9	7.6	21.1
TOTAL	1020.19	343.50	294.62	49.26	200.12	427.32

Table 1a - Basin 4 Pre-Olympia Monthly Water Budget for Outwash Grass Under Developed Condition

OW-Grass Acreage	7.00									
Developed Conditions										
Month	PPT (Inches)	PPT (ac-ft)	Estimated ET (Inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (Inches)	ET with exc. set = to PPT (ac-ft)	RCH predicted by WRI-01-4110 (in)	RCH (ac-ft)	RO (Inches)	RO (ac-ft)
Oct	5.0	2.9	1.0	0.6	1.0	0.6	3.8	2.2	0.2	0.1
Nov	7.4	4.3	0.7	0.4	0.7	0.4	6.3	3.7	0.4	0.2
Dec	7.5	4.4	0.6	0.3	0.6	0.3	6.5	3.8	0.4	0.2
Jan	7.1	4.2	0.8	0.5	0.8	0.5	6.0	3.5	0.4	0.2
Feb	5.4	3.1	0.8	0.5	0.8	0.5	4.3	2.5	0.3	0.2
Mar	5.3	3.1	1.6	1.0	1.6	1.0	3.4	2.0	0.2	0.1
Apr	4.2	2.5	2.1	1.2	2.1	1.2	2.1	1.2	0.1	0.1
May	3.3	1.9	2.4	1.4	2.4	1.4	0.8	0.5	0.1	0.0
Jun	2.9	1.7	2.4	1.4	2.4	1.4	0.5	0.3	0.0	0.0
Jul	1.4	0.8	2.4	1.4	1.4	0.8	0.0	0.0	-1.0	-0.6
Aug	1.6	1.0	2.0	1.2	1.6	1.0	0.0	0.0	-0.4	-0.2
Sep	2.9	1.7	1.5	0.9	1.5	0.9	1.3	0.7	0.1	0.0
TOTAL	54.1	31.5	18.3	10.7	16.9	9.9	35.0	20.4	0.8	0.5

Table 1b - Basin 4 Pre-Olympia Monthly Water Budget for Outwash Forest Under Developed Condition

OW-forest acreage	9.90									
Developed Conditions										
Month	PPT (Inches)	PPT (ac-ft)	Estimated ET (Inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (Inches)	ET with exc. set = to PPT (ac-ft)	RCH [ppt-et] (in)	RCH ow (ac-ft)	RO (Inches)	RO (ac-ft)
Oct	5.0	4.1	1.2	0.9	1.2	0.9	3.9	3.2	0.0	0.0
Nov	7.4	6.1	0.7	0.6	0.7	0.6	6.7	5.5	0.0	0.0
Dec	7.5	6.2	0.6	0.5	0.6	0.5	6.9	5.7	0.0	0.0
Jan	7.1	5.9	0.8	0.7	0.8	0.7	6.3	5.2	0.0	0.0
Feb	5.4	4.4	0.8	0.7	0.8	0.7	4.6	3.8	0.0	0.0
Mar	5.3	4.4	1.7	1.4	1.7	1.4	3.6	2.9	0.0	0.0
Apr	4.2	3.5	2.5	2.1	2.5	2.1	1.7	1.4	0.0	0.0
May	3.3	2.7	3.8	3.1	3.3	2.7	0.0	0.0	(0.5)	(0.4)
Jun	2.9	2.4	4.2	3.4	2.9	2.4	0.0	0.0	(1.2)	(1.0)
Jul	1.4	1.1	3.7	3.1	1.4	1.1	0.0	0.0	(2.3)	(1.9)
Aug	1.6	1.3	1.8	1.5	1.6	1.3	0.0	0.0	(0.2)	(0.2)
Sep	2.9	2.4	1.6	1.3	1.6	1.3	1.3	1.1	0.0	0.0
TOTAL	54.1	44.6	23.4	19.3	19.1	15.7	34.98	28.9	(4.3)	(3.5)

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Table 1c - Basin 4 Pre-Olympia Monthly Water Budget for Impervious Under Developed Conditions

Impervious Acreage		65.80									
Developed Conditions											
Month	PPT (Inches)	PPT (ac-ft)	Estimated ET (Inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (Inches)	ET with exc. set = to PPT (ac-ft)	RCH (in)	RCH (ac-ft)	RO (Inches)	RO (ac-ft)	
Oct	5.0	27.6	0.7	3.9	0.7	3.9	0.0	0.0	4.3	23.7	
Nov	7.4	40.5	0.6	3.3	0.6	3.3	0.0	0.0	6.8	37.2	
Dec	7.5	41.0	0.5	3.0	0.5	3.0	0.0	0.0	6.9	38.0	
Jan	7.1	39.1	0.7	3.8	0.7	3.8	0.0	0.0	6.4	35.3	
Feb	5.4	29.5	0.6	3.5	0.6	3.5	0.0	0.0	4.7	26.0	
Mar	5.3	29.0	1.1	5.9	1.1	5.9	0.0	0.0	4.2	23.1	
Apr	4.2	23.2	1.0	5.5	1.0	5.5	0.0	0.0	3.2	17.7	
May	3.3	17.9	0.9	4.7	0.9	4.7	0.0	0.0	2.4	13.3	
Jun	2.9	16.1	0.7	3.8	0.7	3.8	0.0	0.0	2.2	12.3	
Jul	1.4	7.6	0.4	2.1	0.4	2.1	0.0	0.0	1.0	5.5	
Aug	1.6	8.9	0.5	2.5	0.5	2.5	0.0	0.0	1.2	6.4	
Sep	2.9	15.9	0.6	3.4	0.6	3.4	0.0	0.0	2.3	12.5	
TOTAL	54.1	296.4	8.3	45.5	8.3	45.5	0.0	0.0	45.8	250.9	

Table 1d - Basin 4 Pre-Olympia Monthly Water Budget for Till Forest Under Developed Conditions

Till-Forest Acreage		115.80									
Developed Conditions											
Month	PPT (Inches)	PPT (ac-ft)	Estimated ET (Inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (Inches)	ET with exc. set = to PPT (ac-ft)	RCH predicted by WRI-01-4110 (in)	RCH (ac-ft)	RO (Inches)	RO (ac-ft)	
Oct	5.0	48.5	1.2	11.1	1.2	11.1	1.9	17.9	2.0	19.6	
Nov	7.4	71.3	0.7	6.7	0.7	6.7	3.2	30.9	3.5	33.8	
Dec	7.5	72.1	0.6	5.6	0.6	5.6	3.3	31.7	3.6	34.7	
Jan	7.1	68.8	0.8	7.8	0.8	7.8	3.0	29.1	3.3	31.9	
Feb	5.4	51.9	0.8	8.0	0.8	8.0	2.2	21.0	2.4	22.9	
Mar	5.3	51.0	1.7	16.7	1.7	16.7	1.7	16.4	1.9	18.0	
Apr	4.2	40.8	2.5	24.0	2.5	24.0	0.8	8.0	0.9	8.8	
May	3.3	31.6	3.8	36.6	3.3	31.6	0.0	0.0	(0.5)	(5.0)	
Jun	2.9	28.4	4.2	40.3	2.9	28.4	0.0	0.0	(1.2)	(12.0)	
Jul	1.4	13.4	3.7	36.0	1.4	13.4	0.0	0.0	(2.3)	(22.6)	
Aug	1.6	15.7	1.8	17.6	1.6	15.7	0.0	0.0	(0.2)	(1.8)	
Sep	2.9	28.0	1.6	15.1	1.6	15.1	0.6	6.2	0.7	6.8	
TOTAL	54.1	521.6	23.4	225.4	19.1	184.0	16.7	161.2	14.0	135.0	

Table 1e - Basin 4 Pre-Olympia Monthly Water Budget for Till Grass Under Developed Conditions

Till-Grass Acreage		28.00									
Developed Conditions											
Month	PPT (Inches)	PPT (ac-ft)	Estimated ET (Inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (Inches)	ET with exc. set = to PPT (ac-ft)	RCH predicted by WRI-01-4110 (in)	RCH (ac-ft)	RO (Inches)	RO (ac-ft)	
Oct	5.0	11.7	1.0	2.4	1.0	2.4	1.8	4.2	2.2	5.2	
Nov	7.4	17.2	0.7	1.5	0.7	1.5	3.0	7.1	3.7	8.6	
Dec	7.5	17.4	0.6	1.3	0.6	1.3	3.1	7.2	3.8	8.9	
Jan	7.1	16.6	0.8	1.9	0.8	1.9	2.8	6.6	3.5	8.1	
Feb	5.4	12.6	0.8	1.9	0.8	1.9	2.1	4.8	2.5	5.9	
Mar	5.3	12.3	1.6	3.8	1.6	3.8	1.6	3.8	2.0	4.7	
Apr	4.2	9.9	2.1	4.8	2.1	4.8	1.0	2.3	1.2	2.8	
May	3.3	7.6	2.4	5.6	2.4	5.6	0.4	0.9	0.5	1.1	
Jun	2.9	6.9	2.4	5.6	2.4	5.6	0.2	0.6	0.3	0.7	
Jul	1.4	3.2	2.4	5.5	1.4	3.2	0.0	0.0	(1.0)	(2.3)	
Aug	1.6	3.8	2.0	4.7	1.6	3.8	0.0	0.0	(0.4)	(0.9)	
Sep	2.9	6.8	1.5	3.6	1.5	3.6	0.6	1.4	0.7	1.7	
TOTAL	54.1	126.1	18.3	42.6	16.9	39.5	16.7	39.0	19.1	44.5	

BasinQvic_LID Developed Condition Summary Table											
Basin 4 LID AC		133.30									
Developed Conditions											
Month	PPT (ac-ft)	Estimated ET (ac-ft)	ET with exc. set = to PPT (ac-ft)	RCH from OW (ac-ft)	RCH from Till (ac-ft)	RO (ac-ft)					
Oct	55.9	8.9	8.9	13.2		33.7					0.0
Nov	82.1	6.9	6.9	22.1		53.1					0.0
Dec	83.0	6.1	6.1	22.7		54.2					0.0
Jan	79.2	8.1	8.1	20.8		50.3					0.0
Feb	59.8	7.7	7.7	15.0		37.0					0.0
Mar	58.8	14.0	14.0	12.0		32.8					0.0
Apr	47.0	14.9	14.9	7.1		25.0					0.0
May	36.3	15.0	15.0	2.7		18.6					0.0
Jun	32.7	13.9	13.8	1.7		17.1					0.0
Jul	15.4	11.4	7.8	0.0		4.1					0.0
Aug	18.1	10.5	9.2	0.0		7.6					0.0
Sep	32.2	10.1	10.1	4.5		17.7					0.0
TOTAL	600.4	127.4	122.4	121.8		351.2					0.0

BasinQvic_LID Monthly Water Budget for Outwash Grass Under Developed Conditions											
OW-Grass Acreage		40.70									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH predicted by WRI-01-4110 (in)	RCH (ac-ft)	RO (inches)	RO (ac-ft)	
Oct	5.0	17.1	1.0	3.4	1.0	3.4	3.8	12.8	0.2	0.8	0.0
Nov	7.4	25.1	0.7	2.2	0.7	2.2	6.3	21.5	0.4	1.3	0.0
Dec	7.5	25.3	0.6	1.9	0.6	1.9	6.5	22.0	0.4	1.4	0.0
Jan	7.1	24.2	0.8	2.7	0.8	2.7	6.0	20.2	0.4	1.2	0.0
Feb	5.4	18.2	0.8	2.7	0.8	2.7	4.3	14.6	0.3	0.9	0.0
Mar	5.3	17.9	1.8	5.6	1.6	5.6	3.4	11.7	0.2	0.7	0.0
Apr	4.2	14.3	2.1	7.0	2.1	7.0	2.1	7.0	0.1	0.4	0.0
May	3.3	11.1	2.4	8.2	2.4	8.2	0.8	2.7	0.1	0.2	0.0
Jun	2.9	10.0	2.4	8.2	2.4	8.2	0.5	1.7	0.0	0.1	0.0
Jul	1.4	4.7	2.4	8.0	1.4	4.7	0.0	0.0	-1.0	-3.3	0.0
Aug	1.6	5.5	2.0	6.8	1.6	5.5	0.0	0.0	-0.4	-1.3	0.0
Sep	2.9	9.8	1.5	5.2	1.5	5.2	1.3	4.3	0.1	0.3	0.0
TOTAL	54.1	183.3	18.3	62.0	16.9	57.4	35.0	118.6	0.8	2.7	0.0

BasinQvic_LID Monthly Water Budget for Outwash Forest Under Developed Conditions											
OW-forest acreage		1.10									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH [ppt-et] (in)	RCH ow (ac-ft)	RO (inches)	RO (ac-ft)	
Oct	5.0	0.5	1.2	0.1	1.2	0.1	3.9	0.4	0.0	0.0	0.0
Nov	7.4	0.7	0.7	0.1	0.7	0.1	6.7	0.6	0.0	0.0	0.0
Dec	7.5	0.7	0.6	0.1	0.6	0.1	6.9	0.6	0.0	0.0	0.0
Jan	7.1	0.7	0.8	0.1	0.8	0.1	6.3	0.6	0.0	0.0	(0.0)
Feb	5.4	0.5	0.8	0.1	0.8	0.1	4.6	0.4	0.0	0.0	0.0
Mar	5.3	0.5	1.7	0.2	1.7	0.2	3.6	0.3	0.0	0.0	0.0
Apr	4.2	0.4	2.5	0.2	2.5	0.2	1.7	0.2	0.0	0.0	0.0
May	3.3	0.3	3.8	0.3	3.3	0.3	0.0	0.0	(0.5)	(0.0)	0.0
Jun	2.9	0.3	4.2	0.4	2.9	0.3	0.0	0.0	(1.2)	(0.1)	0.0
Jul	1.4	0.1	3.7	0.3	1.4	0.1	0.0	0.0	(2.3)	(0.2)	0.0
Aug	1.6	0.1	1.8	0.2	1.6	0.1	0.0	0.0	(0.2)	(0.0)	0.0
Sep	2.9	0.3	1.6	0.1	1.6	0.1	1.3	0.1	0.0	0.0	0.0
TOTAL	54.1	5.0	23.4	2.1	19.1	1.7	34.98	3.2	(4.3)	(0.4)	0.0

BasinQvic_LID Monthly Water Budget for Outwash Impervious Under Developed Conditions											
OW-imp Acreage		91.50									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH (in)	RCH (ac-ft)	RO (inches)	RO (ac-ft)	
Oct	5.0	38.4	0.7	5.4	0.7	5.4	0.0	0.0	4.3	32.9	0.0
Nov	7.4	56.3	0.6	4.6	0.6	4.6	0.0	0.0	6.8	51.8	0.0
Dec	7.5	57.0	0.5	4.1	0.5	4.1	0.0	0.0	6.9	52.8	0.0
Jan	7.1	54.4	0.7	5.3	0.7	5.3	0.0	0.0	6.4	49.0	0.0
Feb	5.4	41.0	0.6	4.9	0.6	4.9	0.0	0.0	4.7	38.1	0.0
Mar	5.3	40.3	1.1	8.2	1.1	8.2	0.0	0.0	4.2	32.1	0.0
Apr	4.2	32.3	1.0	7.7	1.0	7.7	0.0	0.0	3.2	24.6	0.0
May	3.3	24.9	0.9	6.5	0.9	6.5	0.0	0.0	2.4	18.5	0.0
Jun	2.9	22.4	0.7	5.3	0.7	5.3	0.0	0.0	2.2	17.1	0.0
Jul	1.4	10.6	0.4	3.0	0.4	3.0	0.0	0.0	1.0	7.6	0.0
Aug	1.6	12.4	0.5	3.5	0.5	3.5	0.0	0.0	1.2	8.9	0.0
Sep	2.9	22.1	0.6	4.7	0.6	4.7	0.0	0.0	2.3	17.4	0.0
TOTAL	54.1	412.1	8.3	63.3	8.3	63.3	0.0	0.0	45.8	348.8	0.0

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Basin 4 Qpog2 Developed Condition Summary Table						
Basin 4 Qpog2 AC		201.80				
Developed Conditions						
Month	PPT (ac-ft)	Estimated ET (ac-ft)	ET with exc. set = to PPT (ac-ft)	RCH from OW (ac-ft)	RCH from Till (ac-ft)	RO (ac-ft)
Oct	84.6	15.2	15.2	0.0	16.3	53.1
Nov	124.3	10.8	10.8	0.0	27.6	85.9
Dec	125.6	9.4	9.4	0.0	28.4	87.8
Jan	119.9	12.7	12.7	0.0	26.0	81.2
Feb	90.5	12.4	12.4	0.0	18.8	59.3
Mar	89.0	23.5	23.5	0.0	14.8	50.6
Apr	71.1	28.1	28.1	0.0	8.1	34.9
May	55.0	34.1	31.8	0.0	1.8	19.1
Jun	49.4	34.5	29.2	0.0	1.1	13.8
Jul	23.4	30.0	15.5	0.0	0.0	-6.6
Aug	27.4	20.7	18.1	0.0	0.0	6.8
Sep	48.8	18.7	18.7	0.0	5.6	24.5
TOTAL	908.94	249.99	225.42	0.00	148.49	510.46

Table 1a - Basin 4 Qpog2 Monthly Water Budget for Outwash Grass Under Developed Conditions

DW-Grass Acreage		0.00									
Developed Conditions											
Month	PPT (Inches)	PPT (ac-ft)	Estimated ET (Inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (Inches)	ET with exc. set = to PPT (ac-ft)	RCH predicted by WRI-01-4110 (in)	RCH (ac-ft)	RO (Inches)	RO (ac-ft)	
Oct	5.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Nov	7.4	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Dec	7.5	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Jan	7.1	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Feb	5.4	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Mar	5.3	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Apr	4.2	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
May	3.3	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Jun	2.9	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Jul	1.4	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Aug	1.6	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sep	2.9	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
TOTAL	54.1	0.0	18.3	0.0	0.0	0.0	35.0	0.0	0.0	0.0	

Table 1b - Basin 4 Qpog2 Monthly Water Budget for Outwash Forest Under Developed Conditions

DW-forest acreage		0.00									
Developed Conditions											
Month	PPT (Inches)	PPT (ac-ft)	Estimated ET (Inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (Inches)	ET with exc. set = to PPT (ac-ft)	RCH [ppt-et] (in)	RCH ow (ac-ft)	RO (Inches)	RO (ac-ft)	
Oct	5.0	0.0	1.2	0.0	0.0	0.0	5.0	0.0	0.0	0.0	
Nov	7.4	0.0	0.7	0.0	0.0	0.0	7.4	0.0	0.0	0.0	
Dec	7.5	0.0	0.6	0.0	0.0	0.0	7.5	0.0	0.0	0.0	
Jan	7.1	0.0	0.8	0.0	0.0	0.0	7.1	0.0	0.0	0.0	
Feb	5.4	0.0	0.8	0.0	0.0	0.0	5.4	0.0	0.0	0.0	
Mar	5.3	0.0	1.7	0.0	0.0	0.0	5.3	0.0	0.0	0.0	
Apr	4.2	0.0	2.5	0.0	0.0	0.0	4.2	0.0	0.0	0.0	
May	3.3	0.0	3.8	0.0	0.0	0.0	3.3	0.0	0.0	0.0	
Jun	2.9	0.0	4.2	0.0	0.0	0.0	2.9	0.0	0.0	0.0	
Jul	1.4	0.0	3.7	0.0	0.0	0.0	1.4	0.0	0.0	0.0	
Aug	1.6	0.0	1.8	0.0	0.0	0.0	1.6	0.0	0.0	0.0	
Sep	2.9	0.0	1.6	0.0	0.0	0.0	2.9	0.0	0.0	0.0	
TOTAL	54.1	0.0	23.4	0.0	0.0	0.0	54.05	0.0	0.0	0.0	

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Table 1c - Basin 4 Qpog2 Monthly Water Budget for Impervious Under Developed Conditions

Impervious Acreage		95.10								
Developed Conditions										
Month	PPT (Inches)	PPT (ac-ft)	Estimated ET (Inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (Inches)	ET with exc. set = to PPT (ac-ft)	RCH (in)	RCH (ac-ft)	RO (Inches)	RO (ac-ft)
Oct	5.0	39.9	0.7	5.6	0.7	5.6	0.0	0.0	4.3	34.2
Nov	7.4	58.6	0.6	4.8	0.6	4.8	0.0	0.0	6.8	53.8
Dec	7.5	59.2	0.5	4.3	0.5	4.3	0.0	0.0	6.9	54.9
Jan	7.1	56.5	0.7	5.5	0.7	5.5	0.0	0.0	6.4	51.0
Feb	5.4	42.6	0.6	5.1	0.6	5.1	0.0	0.0	4.7	37.6
Mar	5.3	41.9	1.1	8.6	1.1	8.6	0.0	0.0	4.2	33.4
Apr	4.2	33.5	1.0	8.0	1.0	8.0	0.0	0.0	3.2	25.5
May	3.3	25.9	0.9	6.7	0.9	6.7	0.0	0.0	2.4	19.2
Jun	2.9	23.3	0.7	5.5	0.7	5.5	0.0	0.0	2.2	17.8
Jul	1.4	11.0	0.4	3.1	0.4	3.1	0.0	0.0	1.0	7.9
Aug	1.6	12.9	0.5	3.6	0.5	3.6	0.0	0.0	1.2	9.3
Sep	2.9	23.0	0.6	4.9	0.6	4.9	0.0	0.0	2.3	18.1
TOTAL	54.1	428.3	8.3	65.8	8.3	65.8	0.0	0.0	45.8	362.6

Table 1d - Basin 4 Qpog2 Monthly Water Budget for Till Forest Under Developed Conditions

Till-Forest Acreage		51.30								
Developed Conditions										
Month	PPT (Inches)	PPT (ac-ft)	Estimated ET (Inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (Inches)	ET with exc. set = to PPT (ac-ft)	RCH predicted by WRI-01-4110 (in)	RCH (ac-ft)	RO (Inches)	RO (ac-ft)
Oct	5.0	21.5	1.2	4.9	1.2	4.9	1.9	7.9	2.0	8.7
Nov	7.4	31.6	0.7	2.9	0.7	2.9	3.2	13.7	3.5	15.0
Dec	7.5	31.9	0.6	2.5	0.6	2.5	3.3	14.1	3.6	15.4
Jan	7.1	30.5	0.8	3.5	0.8	3.5	3.0	12.9	3.3	14.1
Feb	5.4	23.0	0.8	3.5	0.8	3.5	2.2	9.3	2.4	10.2
Mar	5.3	22.6	1.7	7.4	1.7	7.4	1.7	7.3	1.9	8.0
Apr	4.2	18.1	2.5	10.6	2.5	10.6	0.8	3.6	0.9	3.9
May	3.3	14.0	3.8	16.2	3.3	14.0	0.0	0.0	(0.5)	(2.2)
Jun	2.9	12.6	4.2	17.9	2.9	12.6	0.0	0.0	(1.2)	(5.3)
Jul	1.4	5.9	3.7	15.9	1.4	5.9	0.0	0.0	(2.3)	(10.0)
Aug	1.6	7.0	1.8	7.8	1.8	7.0	0.0	0.0	(0.2)	(0.8)
Sep	2.9	12.4	1.6	6.7	1.6	6.7	0.6	2.7	0.7	3.0
TOTAL	54.1	231.1	23.4	99.9	19.1	81.5	16.7	71.4	14.0	59.8

Table 1e - Basin 4 Qpog2 Monthly Water Budget for Till Grass Under Developed Conditions

Till-Grass Acreage		55.40								
Developed Conditions										
Month	PPT (Inches)	PPT (ac-ft)	Estimated ET (Inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (Inches)	ET with exc. set = to PPT (ac-ft)	RCH predicted by WRI-01-4110 (in)	RCH (ac-ft)	RO (Inches)	RO (ac-ft)
Oct	5.0	23.2	1.0	4.7	1.0	4.7	1.8	8.3	2.2	10.2
Nov	7.4	34.1	0.7	3.0	0.7	3.0	3.0	14.0	3.7	17.1
Dec	7.5	34.5	0.6	2.6	0.6	2.6	3.1	14.3	3.8	17.5
Jan	7.1	32.9	0.8	3.7	0.8	3.7	2.8	13.1	3.5	16.1
Feb	5.4	24.8	0.8	3.7	0.8	3.7	2.1	9.5	2.5	11.6
Mar	5.3	24.4	1.6	7.6	1.6	7.6	1.6	7.6	2.0	9.3
Apr	4.2	19.5	2.1	9.5	2.1	9.5	1.0	4.5	1.2	5.5
May	3.3	15.1	2.4	11.1	2.4	11.1	0.4	1.8	0.5	2.2
Jun	2.9	13.6	2.4	11.1	2.4	11.1	0.2	1.1	0.3	1.3
Jul	1.4	6.4	2.4	10.9	1.4	6.4	0.0	0.0	(1.0)	(4.5)
Aug	1.6	7.5	2.0	9.2	1.6	7.5	0.0	0.0	(0.4)	(1.7)
Sep	2.9	13.4	1.5	7.1	1.5	7.1	0.6	2.8	0.7	3.5
TOTAL	54.1	249.5	18.3	84.3	16.9	78.1	16.7	77.1	19.1	88.1

Basin 5 Developed Condition Summary Table						
Basin 5 AC		107.70				
Developed Conditions						
Month	PPT (ac-ft)	Estimated ET (ac-ft)	ET with exc. set = to PPT (ac-ft)	RCH from OW (ac-ft)	RCH from Till (ac-ft)	RO (ac-ft)
Oct	45.1	9.5	9.5		13.9	21.7
Nov	86.3	6.0	6.0		23.8	36.5
Dec	67.0	5.1	5.1		24.5	37.4
Jan	64.0	7.1	7.1		22.5	34.4
Feb	48.3	7.2	7.2		16.2	24.9
Mar	47.5	14.5	14.5		12.7	20.3
Apr	38.0	19.8	19.8		6.4	11.8
May	29.3	28.4	25.0		0.3	0.6
Jun	26.4	30.8	22.6		0.2	-4.6
Jul	12.5	27.3	11.0		0.0	-14.9
Aug	14.6	14.5	12.9		0.0	0.1
Sep	28.0	12.6	12.6		4.8	8.7
TOTAL	485.10	182.90	153.35		125.25	176.94

Table 1c - Basin 5 Monthly Water Budget for Impervious Under Developed Conditions

Impervious Acreage		17.70									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH (in)	RCH (ac-ft)	RO (inches)	RO (ac-ft)	RO (ac-ft)
Oct	5.0	7.4	0.7	1.0	0.7	1.0	0.0	0.0	4.3	6.4	0.0
Nov	7.4	10.9	0.6	0.9	0.6	0.9	0.0	0.0	6.8	10.0	0.0
Dec	7.5	11.0	0.5	0.8	0.5	0.8	0.0	0.0	6.9	10.2	0.0
Jan	7.1	10.5	0.7	1.0	0.7	1.0	0.0	0.0	6.4	9.5	0.0
Feb	5.4	7.9	0.6	0.9	0.6	0.9	0.0	0.0	4.7	7.0	0.0
Mar	5.3	7.8	1.1	1.6	1.1	1.6	0.0	0.0	4.2	6.2	0.0
Apr	4.2	6.2	1.0	1.5	1.0	1.5	0.0	0.0	3.2	4.7	0.0
May	3.3	4.8	0.9	1.3	0.9	1.3	0.0	0.0	2.4	3.6	0.0
Jun	2.9	4.3	0.7	1.0	0.7	1.0	0.0	0.0	2.2	3.3	0.0
Jul	1.4	2.1	0.4	0.6	0.4	0.6	0.0	0.0	1.0	1.5	0.0
Aug	1.6	2.4	0.6	0.7	0.5	0.7	0.0	0.0	1.2	1.7	0.0
Sep	2.9	4.3	0.6	0.9	0.6	0.9	0.0	0.0	2.3	3.4	0.0
TOTAL	54.1	79.7	8.3	12.2	8.3	12.2	0.0	0.0	45.8	67.5	0.0

Table 1d - Basin 5 Monthly Water Budget for Till Forest Under Developed Conditions

Till-Forest Acreage		79.30									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH predicted by WRI-01-4110 (in)	RCH (ac-ft)	RO (inches)	RO (ac-ft)	RO (ac-ft)
Oct	5.0	33.2	1.2	7.6	1.2	7.6	1.9	12.2	2.0	13.4	0.0
Nov	7.4	48.8	0.7	4.6	0.7	4.6	3.2	21.1	3.5	23.1	0.0
Dec	7.5	49.4	0.6	3.8	0.6	3.8	3.3	21.7	3.6	23.8	0.0
Jan	7.1	47.1	0.8	5.4	0.8	5.4	3.0	19.9	3.3	21.8	0.0
Feb	5.4	35.6	0.8	5.5	0.8	5.5	2.2	14.4	2.4	15.7	0.0
Mar	5.3	35.0	1.7	11.4	1.7	11.4	1.7	11.2	1.9	12.3	0.0
Apr	4.2	28.0	2.5	16.5	2.5	16.5	0.8	5.5	0.9	6.0	0.0
May	3.3	21.6	3.8	25.0	3.3	21.6	0.0	0.0	(0.5)	(3.4)	0.0
Jun	2.9	19.4	4.2	27.6	2.9	19.4	0.0	0.0	(1.2)	(8.2)	0.0
Jul	1.4	9.2	3.7	24.6	1.4	9.2	0.0	0.0	(2.3)	(15.5)	0.0
Aug	1.6	10.8	1.8	12.0	1.6	10.8	0.0	0.0	(0.2)	(1.3)	0.0
Sep	2.9	19.2	1.6	10.3	1.6	10.3	0.6	4.2	0.7	4.6	0.0
TOTAL	54.1	357.2	23.4	154.4	19.1	126.0	16.7	110.4	14.0	92.5	0.0

Table 1e - Basin 5 Monthly Water Budget for Till Grass Under Developed Conditions

Till-Grass Acreage		10.70									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH predicted by WRI-01-4110 (in)	RCH (ac-ft)	RO (inches)	RO (ac-ft)	RO (ac-ft)
Oct	5.0	4.5	1.0	0.9	1.0	0.9	1.8	1.8	2.2	2.0	0.0
Nov	7.4	6.6	0.7	0.6	0.7	0.6	3.0	2.7	3.7	3.3	0.0
Dec	7.5	6.7	0.6	0.5	0.6	0.5	3.1	2.8	3.8	3.4	0.0
Jan	7.1	6.4	0.8	0.7	0.8	0.7	2.8	2.5	3.5	3.1	0.0
Feb	5.4	4.8	0.8	0.7	0.8	0.7	2.1	1.8	2.5	2.2	0.0
Mar	5.3	4.7	1.6	1.5	1.6	1.5	1.6	1.5	2.0	1.8	0.0
Apr	4.2	3.8	2.1	1.8	2.1	1.8	1.0	0.9	1.2	1.1	0.0
May	3.3	2.9	2.4	2.1	2.4	2.1	0.4	0.3	0.5	0.4	0.0
Jun	2.9	2.6	2.4	2.1	2.4	2.1	0.2	0.2	0.3	0.3	0.0
Jul	1.4	1.2	2.4	2.1	1.4	1.2	0.0	0.0	(1.0)	(0.9)	0.0
Aug	1.6	1.5	2.0	1.8	1.6	1.5	0.0	0.0	(0.4)	(0.3)	0.0
Sep	2.9	2.6	1.5	1.4	1.5	1.4	0.6	0.5	0.7	0.7	0.0
TOTAL	54.1	48.2	18.3	16.3	16.9	15.1	16.7	14.9	19.1	17.0	0.0

Basin 6 Developed Condition Summary Table

Basin 6 AC		93.20							
Developed Conditions									
Month	PPT (ac-ft)	Estimated ET (ac-ft)	ET with exc. set = to PPT (ac-ft)	RCH from OW (ac-ft)	RCH from Till (ac-ft)	RO (ac-ft)			
Oct	39.1	8.6	8.6		13.1	17.4			0.0
Nov	57.4	5.3	5.3		22.5	29.6			0.0
Dec	58.0	4.5	4.5		23.2	30.4			0.0
Jan	55.4	6.2	6.2		21.2	27.9			0.0
Feb	41.8	6.3	6.3		15.3	20.2			0.0
Mar	41.1	12.9	12.9		12.0	16.2			0.0
Apr	32.9	18.1	18.1		5.9	8.8			0.0
May	25.4	26.9	23.4		0.1	-1.6			0.0
Jun	22.8	29.4	21.1		0.1	-6.6			0.0
Jul	10.8	26.1	10.1		0.0	-15.3			0.0
Aug	12.7	13.2	11.8		0.0	-0.6			0.0
Sep	22.5	11.4	11.4		4.5	6.6			0.0
TOTAL	419.79	168.94	139.71		117.87	132.98			0.0

Table 1c - Basin 6 Monthly Water Budget for Impervious Under Developed Conditions

Impervious Acreage		8.50									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH (in)	RCH (ac-ft)	RO (inches)	RO (ac-ft)	
Oct	5.0	3.6	0.7	0.5	0.7	0.5	0.0	0.0	4.3	3.1	0.0
Nov	7.4	5.2	0.6	0.4	0.6	0.4	0.0	0.0	6.8	4.8	0.0
Dec	7.5	5.3	0.5	0.4	0.5	0.4	0.0	0.0	6.9	4.9	0.0
Jan	7.1	5.1	0.7	0.5	0.7	0.5	0.0	0.0	6.4	4.8	0.0
Feb	5.4	3.8	0.6	0.5	0.8	0.6	0.0	0.0	4.7	3.4	0.0
Mar	5.3	3.7	1.1	0.8	1.1	0.8	0.0	0.0	4.2	3.0	0.0
Apr	4.2	3.0	1.0	0.7	1.0	0.7	0.0	0.0	3.2	2.3	0.0
May	3.3	2.3	0.9	0.6	0.9	0.6	0.0	0.0	2.4	1.7	0.0
Jun	2.9	2.1	0.7	0.5	0.7	0.5	0.0	0.0	2.2	1.6	0.0
Jul	1.4	1.0	0.4	0.3	0.4	0.3	0.0	0.0	1.0	0.7	0.0
Aug	1.6	1.2	0.5	0.3	0.5	0.3	0.0	0.0	1.2	0.8	0.0
Sep	2.9	2.1	0.6	0.4	0.6	0.4	0.0	0.0	2.3	1.6	0.0
TOTAL	64.1	38.3	8.3	6.9	8.3	5.9	0.0	0.0	45.8	32.4	0.0

Table 1d - Basin 6 Monthly Water Budget for Till Forest Under Developed Conditions

Till-Forest Acreage		80.40									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH predicted by WRI-01-1110 (in)	RCH (ac-ft)	RO (inches)	RO (ac-ft)	
Oct	5.0	33.7	1.2	7.7	1.2	7.7	1.9	12.4	2.0	13.6	0.0
Nov	7.4	49.5	0.7	4.6	0.7	4.6	3.2	21.4	3.5	23.5	0.0
Dec	7.5	50.0	0.6	3.9	0.6	3.9	3.3	22.0	3.8	24.1	0.0
Jan	7.1	47.8	0.8	5.4	0.8	5.4	3.0	20.2	3.3	22.1	0.0
Feb	5.4	36.0	0.8	5.6	0.8	5.6	2.2	14.6	2.4	15.9	0.0
Mar	5.3	35.4	1.7	11.6	1.7	11.6	1.7	11.4	1.9	12.5	0.0
Apr	4.2	28.3	2.5	16.7	2.5	16.7	0.8	5.6	0.9	6.1	0.0
May	3.3	21.9	3.6	25.4	3.3	21.9	0.0	0.0	(0.5)	(3.5)	0.0
Jun	2.9	19.7	4.2	28.0	2.9	19.7	0.0	0.0	(1.2)	(8.3)	0.0
Jul	1.4	9.3	3.7	25.0	1.4	9.3	0.0	0.0	(2.3)	(15.7)	0.0
Aug	1.6	10.9	1.8	12.2	1.6	10.9	0.0	0.0	(0.2)	(1.3)	0.0
Sep	2.9	19.4	1.6	10.5	1.6	10.5	0.8	4.3	0.7	4.7	0.0
TOTAL	54.1	362.1	23.4	166.5	19.1	127.8	16.7	111.9	14.0	93.7	0.0

Table 1e - Basin 6 Monthly Water Budget for Till Grass Under Developed Conditions

Till-Grass Acreage		4.30									
Developed Conditions											
Month	PPT (inches)	PPT (ac-ft)	Estimated ET (inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (inches)	ET with exc. set = to PPT (ac-ft)	RCH predicted by WRI-01-1110 (in)	RCH (ac-ft)	RO (inches)	RO (ac-ft)	
Oct	5.0	1.8	1.0	0.4	1.0	0.4	1.8	0.6	2.2	0.8	0.0
Nov	7.4	2.6	0.7	0.2	0.7	0.2	3.0	1.1	3.7	1.3	0.0
Dec	7.5	2.7	0.6	0.2	0.6	0.2	3.1	1.1	3.8	1.4	0.0
Jan	7.1	2.6	0.8	0.3	0.8	0.3	2.8	1.0	3.5	1.2	0.0
Feb	5.4	1.9	0.8	0.3	0.8	0.3	2.1	0.7	2.5	0.9	0.0
Mar	5.3	1.9	1.8	0.8	1.6	0.6	1.6	0.6	2.0	0.7	0.0
Apr	4.2	1.5	2.1	0.7	2.1	0.7	1.0	0.4	1.2	0.4	0.0
May	3.3	1.2	2.4	0.9	2.4	0.9	0.4	0.1	0.5	0.2	0.0
Jun	2.9	1.1	2.4	0.9	2.4	0.9	0.2	0.1	0.3	0.1	0.0
Jul	1.4	0.5	2.4	0.8	1.4	0.5	0.0	0.0	(1.0)	(0.4)	0.0
Aug	1.6	0.6	2.0	0.7	1.6	0.8	0.0	0.0	(0.4)	(0.1)	0.0
Sep	2.9	1.0	1.5	0.6	1.5	0.6	0.6	0.2	0.7	0.3	0.0
TOTAL	64.1	19.4	18.3	6.5	16.9	6.1	16.7	6.0	19.1	6.8	0.0

Appendix 10

Basin 7 Monthly Water Budget for Till Forest Under Developed Conditions											
Till-Forest Acreage		28.10									
Developed Conditions											
Month	PPT (Inches)	PPT (ac-ft)	Estimated ET (Inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (Inches)	ET with exc. set = to PPT (ac-ft)	RCH predicted by WRI-01-4110 (in)	RCH (ac-ft)	RO (Inches)	RO (ac-ft)	
Oct	5.0	11.8	1.2	2.7	1.2	2.7	1.9	4.3	2.0	4.7	0.0
Nov	7.4	17.3	0.7	1.6	0.7	1.6	3.2	7.5	3.5	8.2	0.0
Dec	7.5	17.5	0.6	1.4	0.6	1.4	3.3	7.7	3.6	8.4	0.0
Jan	7.1	16.7	0.8	1.9	0.8	1.9	3.0	7.1	3.3	7.7	0.0
Feb	5.4	12.6	0.8	1.9	0.8	1.9	2.2	5.1	2.4	5.6	0.0
Mar	5.3	12.4	1.7	4.1	1.7	4.1	1.7	4.0	1.9	4.4	0.0
Apr	4.2	9.9	2.5	5.8	2.5	5.8	0.8	1.9	0.9	2.1	0.0
May	3.3	7.7	3.8	8.9	3.3	7.7	0.0	0.0	(0.5)	(1.2)	0.0
Jun	2.9	6.9	4.2	9.8	2.9	6.9	0.0	0.0	(1.2)	(2.9)	0.0
Jul	1.4	3.3	3.7	8.7	1.4	3.3	0.0	0.0	(2.3)	(5.5)	0.0
Aug	1.6	3.8	1.8	4.3	1.6	3.8	0.0	0.0	(0.2)	(0.4)	0.0
Sep	2.9	6.8	1.6	3.7	1.6	3.7	0.6	1.5	0.7	1.6	0.0
TOTAL	54.1	126.6	23.4	54.7	19.1	44.7	16.7	39.1	14.0	32.8	0.0
Basin 7 Monthly Water Budget for Till Grass Under Developed Conditions											
Till-Grass Acreage		7.80									
Developed Conditions											
Month	PPT (Inches)	PPT (ac-ft)	Estimated ET (Inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (Inches)	ET with exc. set = to PPT (ac-ft)	RCH predicted by WRI-01-4110 (in)	RCH (ac-ft)	RO (Inches)	RO (ac-ft)	
Oct	5.0	3.3	1.0	0.7	1.0	0.7	1.8	1.2	2.2	1.4	0.0
Nov	7.4	4.8	0.7	0.4	0.7	0.4	3.0	2.0	3.7	2.4	0.0
Dec	7.5	4.9	0.6	0.4	0.6	0.4	3.1	2.0	3.8	2.5	0.0
Jan	7.1	4.6	0.8	0.5	0.8	0.5	2.8	1.9	3.5	2.3	0.0
Feb	5.4	3.5	0.8	0.5	0.8	0.5	2.1	1.3	2.5	1.6	0.0
Mar	5.3	3.4	1.6	1.1	1.6	1.1	1.6	1.1	2.0	1.3	0.0
Apr	4.2	2.7	2.1	1.3	2.1	1.3	1.0	0.6	1.2	0.8	0.0
May	3.3	2.1	2.4	1.6	2.4	1.6	0.4	0.3	0.5	0.3	0.0
Jun	2.9	1.9	2.4	1.6	2.4	1.6	0.2	0.2	0.3	0.2	0.0
Jul	1.4	0.9	2.4	1.5	1.4	0.9	0.0	0.0	(1.0)	(0.6)	0.0
Aug	1.6	1.1	2.0	1.3	1.6	1.1	0.0	0.0	(0.4)	(0.2)	0.0
Sep	2.9	1.9	1.5	1.0	1.5	1.0	0.6	0.4	0.7	0.5	0.0
TOTAL	54.1	35.1	18.3	11.9	16.9	11.0	16.7	10.9	19.1	12.4	0.0

Appendix 10

Basin 7 Monthly Water Budget for Till Under Pre-Developed Conditions												
Till Acreage		70.10 RCH flux through till, RO from Till recharges Qvr in Ravensdale Creek swale										
Existing Conditions												negative RO
Month	PPT (Inches)	PPT (ac-ft)	Estimated ET (Inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (Inches)	ET with exc. set = to PPT (ac-ft)	RCH predicted by WA1-01-4119 (in)	RCH Till (ac-ft)	RO (Inches)	RO (ac-ft)		not add to Qvr RCH (ac-ft)
Oct	5.0	29.4	1.2	6.7	1.2	6.7	1.9	10.8	2.0	11.8	0.0	0.0
Nov	7.4	43.2	0.7	4.0	0.7	4.0	3.2	18.7	3.5	20.5	0.0	0.0
Dec	7.5	43.6	0.6	3.4	0.6	3.4	3.3	19.2	3.6	21.0	0.0	0.0
Jan	7.1	41.7	0.8	4.7	0.8	4.7	3.0	17.6	3.3	19.3	0.0	0.0
Feb	5.4	31.4	0.8	4.8	0.8	4.8	2.2	12.7	2.4	13.9	0.0	0.0
Mar	5.3	30.9	1.7	10.1	1.7	10.1	1.7	9.9	1.9	10.0	0.0	0.0
Apr	4.2	24.7	2.5	14.5	2.5	14.5	0.8	4.9	0.9	5.3	0.0	0.0
May	3.3	19.1	3.8	22.1	3.3	19.1	0.0	0.0	-0.5	-3.0	0.0	-3.0
Jun	2.9	17.2	4.2	24.4	2.9	17.2	0.0	0.0	-1.2	-7.2	0.0	-7.2
Jul	1.4	8.1	3.7	21.8	1.4	8.1	0.0	0.0	-2.3	-13.7	0.0	-13.7
Aug	1.8	9.5	1.8	10.6	1.6	9.5	0.0	0.0	-0.2	-1.1	0.0	-1.1
Sep	2.9	16.9	1.6	9.1	1.6	9.1	0.6	3.7	0.7	4.1	0.0	0.0
TOTAL	54.1	315.7	23.4	136.5	19.1	111.4	16.7	97.6	14.0	117.7	0.0	25.1
Basin 7 Monthly Water Budget for Outwash Under Pre-Developed Conditions												
Outwash Acreage		11.50 recharges Qvr in Ravensdale Creek swale										
Existing Conditions												Total Recharge
Month	PPT (Inches)	PPT (ac-ft)	Estimated ET (Inches)	Estimated ET (ac-ft)	ET with exc. set = to PPT (Inches)	ET with exc. set = to PPT (ac-ft)	RCH [ppt-et] (in)	RCH ow (ac-ft)	RO (Inches)	RO (ac-ft)	positive RO from till to Qvr (ac-ft)	(includes RO from till uplands) (ac-ft)
Oct	5.0	4.8	1.2	1.1	1.2	1.1	3.9	3.7	0.0	0.0	(0.0)	15.6
Nov	7.4	7.1	0.7	0.7	0.7	0.7	6.7	6.4	0.0	0.0	0.0	26.9
Dec	7.5	7.2	0.6	0.6	0.6	0.6	6.9	6.6	0.0	0.0	0.0	27.6
Jan	7.1	6.8	0.8	0.8	0.8	0.8	6.3	6.1	0.0	0.0	0.0	25.4
Feb	5.4	5.2	0.8	0.8	0.8	0.8	4.6	4.4	0.0	0.0	(0.0)	18.3
Mar	5.3	5.1	1.7	1.7	1.7	1.7	3.6	3.4	0.0	0.0	0.0	14.3
Apr	4.2	4.1	2.5	2.4	2.5	2.4	1.7	1.7	0.0	0.0	0.0	7.0
May	3.3	3.1	3.8	3.6	3.3	3.1	0.0	0.0	(0.5)	(0.5)	0.0	0.0
Jun	2.9	2.8	4.2	4.0	2.9	2.8	0.0	0.0	(1.2)	(1.2)	0.0	0.0
Jul	1.4	1.3	3.7	3.6	1.4	1.3	0.0	0.0	(2.3)	(2.2)	0.0	0.0
Aug	1.6	1.6	1.8	1.7	1.6	1.6	0.0	0.0	(0.2)	(0.2)	0.0	0.0
Sep	2.9	2.8	1.6	1.5	1.6	1.5	1.3	1.3	0.0	0.0	0.0	0.0
TOTAL	54.1	51.8	23.4	22.4	19.1	18.3	34.9	33.6	(4.3)	(4.1)	0.0	140.3

Appendix 10

Precipitation and ET.		Evapotranspiration (in.)		
Month	Precip. (in)	Forest	Grass	Road
Oct	5.03	1.15	1.01	0.71
Nov	7.39	0.69	0.66	0.60
Dec	7.47	0.58	0.57	0.54
Jan	7.13	0.81	0.80	0.70
Feb	5.38	0.83	0.81	0.64
Mar	5.29	1.73	1.64	1.08
Apr	4.23	2.49	2.05	1.01
May	3.27	3.79	2.41	0.85
Jun	2.94	4.18	2.41	0.70
Jul	1.39	3.73	2.37	0.39
Aug	1.63	1.82	2.00	0.46
Sep	2.90	1.56	1.54	0.62
Total	54.05	23.36	18.27	8.30

Precip is 0.95 x Landsburg gauge monthly historic
 ET values from Goldsmith, McCormick V Water Bal 2007 using HSPF model. ET values are actual, not potential, per M. Barber.